Appendix A

Wetlands Database

WETLAND ASSESSMENT DATABASE

Title

Reference: Proceedings of the National Wetland Assessment Symposium, Portland, Maine, June 1985

Author(s)

Publisher Jon A. Kusler and Patricia Rieximnger, eds.

Volume number

Issue number

Page(s) viii-x

Multiple Entries? ☐

Date of publication 1985

Assessment method

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title

Reference: Proceedings of the National Wetland Assessment Symposium, Portland, Maine, June 1985

Author(s) J. Henry Sather
Ellis T. Clairain, Jr.

Publisher Jon A. Kusler and Patricia Rieximnger, eds.

Volume number

Issue number

Page(s) 78-79

Multiple Entries? ☐

Date of publication 1985

Assessment method

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

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Title **A Bird Community of Index of Biotic Integrity for the Mid-Atlantic Highlands**

Reference: http://www.cas.psu.edu/docs/CASDEPT/FOREST/wetlands/bci.htm

Author(s) T.J. O'Connell
L.E. Jackson
R.P. Brooks

Publisher

Volume number

Issue number

Page(s)

Multiple Entries? ☐

Date of publication

Assessment method Bird Community Index of Biotic Integrity (BCI)

Notes

Goals of method To function as a landscape-scale indicator of biotic integrity integrating conditions across large sample sites containing diverse ecological resources and intensities of human use.

Uses of method

Status of use

Regions of testing central PA & the Mid-Atlantic Highlands Assessment Area

Wetlands types tested

Results of testing Developed a songbird community-based IBI which sorts bird species found at sample sites into a series of values representing the proportional species richness of 20 behavioral and physiological response guilds.

Used EMAP to select sample sites.

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **A comparison of current wetland assessment methods**

Reference:

Author(s)

Publisher

Volume number

Issue number

Page(s)

Multiple Entries? ☑

Date of publication

Assessment method EMAP-Wetlands

Notes Indices of wetland condition will relate to one or more wetland values and will be compared to those of the least impacted wetlands in the region. One will likely be an index of biological integrity (similar to Karr's stream IBI). Other indices may include habitat integrity, hydrologic integrity, & water quality improvement.

Goals of method To identify indicators of wetland condition.
To stadardize measurement protocols.
To develop indices of condition.
To establish a national network for monitoring wetland condition.

Uses of method To provide the reference conditions database needed by HGM (as long as both programs use comparable classes, similar measurement protocols, & comparable indicators.

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed: biological integrity
harvestable productivity
flood reduction & shoreline protection

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method: Compares indicator conditions to reference conditions.

Limitations of method: Only allows comparisons between wetlands in the same class.

☑ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **A comparison of current wetland assessment methods**

Reference:

Author(s)

Publisher

Volume number

Issue number

Page(s)

Multiple Entries? ☑

Date of publication

Assessment method Hydrogeomorphic Approach (HGM)

Notes HGM will identify which functions an HGM wetland class performs in a region, identify wetland & landscape funtion indicators, & scale the indicators to suggest the degree to which the function is performed.

Goals of method To assess the physical, chemical, & biological functions of wetlands. HGM will revise, regionalize, & simplify WET.

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed: dynamic surface water storage
long term surface water storage
subsurface water storage

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method: HGM will identify which functions an HGM wetland class performs in a region, identify wetland & landscape funtion indicators, &

Limitations of method: Only allows comparisons between wetlands in the same class.

- ☑ Can directly compare wetlands within the same class?
- ☐ Can directly compare wetlands from different classes?
- ☐ Can be used as a guide for design?

Title **A comparison of current wetland assessment methods**

Reference:

Author(s)

Publisher

Volume number

Issue number

Page(s) 3

Multiple Entries? ☑

Date of publication

Assessment method Wetlands Evaluation Technique (WET)

Notes WET was the 1st comprehensive approach to wetland assessment.

Goals of method Uses features of wetland's watershed, topography, vegetation, & others to estimate a rating of "high", "moderate", or "low" for each function & habitat suitability ratings for fisheries, wildlife, & waterfowl.

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed: ground water recharge
ground water discharge
floodflow alteration

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method: Assesses function in terms of "social significance, effectiveness, & opportunity."

Limitations of method:

☑ **Can directly compare wetlands within the same class?**

☑ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **A comparison of current wetland assessment methods**

Reference: http://www.wes.army.mil/el/workshop/FA1-1.html

Author(s) Richard P. Novitzki

Publisher USACOE WES

Volume number

Issue number

Page(s) 4 pp

Multiple Entries? ☑

Date of publication accessed 10/10/99

Assessment method EMAP

Notes "EMAP estimates wetland condition in a region, based on indicator measures obtained in a statistical sample of wetlands. Hence, EMAP information could provide the reference conditions database needed by HGM, so long as both programs use comparable wetland classes, use similar measurement protocols, and establish comparable variables (HGM) and indicators (EMAP). Software developed for HGM and EMAP should create standardized electronic copies of assessments for use by both programs and for subsequent analysis." - p. 3 (conclusions)
unlike WET, it does not have the ability to compare all wetlands in a region

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

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Reference: http://www.wes.army.mil/el/workshop/FA1-1.html

Author(s) Richard P. Novitzki

Publisher USACOE WES

Volume number

Issue number

Page(s) 4 pp.

Multiple Entries? ☑

Date of publication accessed 10/10/99

Assessment method WET

Notes WET set apart from HGM and EMAP by ability to compare all wetlands in a region (to identify those in need of protection, etc.).

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

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Title **A comparison of current wetland assessment methods**

Reference: http://www.wes.army.mil/el/workshop/FA1-1.html

Author(s) Richard P. Novitzki

Publisher USACOE WES

Volume number

Issue number

Page(s) 4 pp.

Multiple Entries? ☑

Date of publication accessed 10/10/99

Assessment method HGM

Notes "HGM assesses functions performed by comparing variables observed in the assessed wetland to those observed in reference wetlands in the region. HGM can identify functional loss resulting from wetland modification or loss, as well as compensatory remediation required. EMAP estimates wetland condition in a region, based on indicator measures obtained in a statistical sample of wetlands. Hence, EMAP information could provide the reference conditions database needed by HGM, so long as both programs use comparable wetland classes, use similar measurement protocols, and establish comparable variables (HGM) and indicators (EMAP). Software developed for HGM and EMAP should create standardized electronic copies of assessments for use by both programs and for subsequent analysis." - p. 3 (conclusions)
unlike WET, it does not have the ability to compare all wetlands in a region

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:	Strenths of method:	Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **A Comprehensive Review of Wetland Assessment Procedures: A Guide for Wetland Practitioners**

Reference: n/a

Author(s) Candy C. Bartoldus

Publisher Environmental Concern Inc., St. Michaels, MD

Volume number n/a

Issue number n/a

Page(s) 196

Multiple Entries? ☑

Date of publication 1999

Assessment method Wildlife Habitat Assessment and Management System (WHAMS)

Notes

Goals of method To provide a process for assessing existing wildlife habitat conditions and developing a plan for their management. Developed for use in developing wildlife management plans on PA State Game Lands, Farms Games Projects, & similar situations.

Uses of method Developed for use in developing wildlife management plans on PA State Game Lands, Farms Games Projects, & similar situations.

Status of use applied.

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements: Team w/the following 4 voting members:
1. Land Management Officer for project area
2. Field Forester for project area
3. Food & Cover Corps Foreman for project area
4. PA Game Commission Game Biologist or Technician, or NRCS Biologist or Technician

Time requirements: preparation: 8 hours
assessment: 8 hours per 1 acre site

Training availability:

Proposed future revisions: There are plans to modify WHAMS to allow the use of current statewide GIS mapping (scheduled availability: July 1999).

Applicable wetland types: Most terrestrial, wetland, and aquatic habitats in PA.

Functions/values assessed: habitat suitability of selected fish, wildlife, or invertebrates

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application: WHAMS has been used on development of game lands management plans and the

Strenths of method: Can directly compare habitats w/in PA.

Limitations of method:

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☑ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

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Issue number n/a

Page(s) 196

Multiple Entries? ☑

Date of publication 1999

Assessment method Wetland Evaluation Technique (WET) (WET II)

Notes

Goals of method To assess wetland functions in the 404 Regulatory Program as well as other regulatory, planning, and management situations.

Uses of method To assess wetland functions in the 404 Regulatory Program as well as other regulatory, planning, and management situations.

Status of use applied

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements: Individuals with a minimum of an undergraduate degree in biology, wildlife management, environmental science or several years of experience in one of these areas.

Time requirements: preparation: 1 day
assessment: 2 hours to assess 1 acre site.

Training availability:

Proposed future revisions: none.

Applicable wetland types: All wetland types in the contiguous US.

Functions/values assessed: ground water recharge/discharge
floodflow alteration
sediment stabilization

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application: WET has been applied to primarily large projects (e.g., highways), a few routine regulatory actions, and some

Strenths of method: Can directly compare all wetland types w/in the contiguous US.

Limitations of method: WET should not be used as a guide for design.

Opportunity variable are used, but upper limits are

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☐ **Can be used as a guide for design?**

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Publisher Environmental Concern Inc., St. Michaels, MD

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Page(s) 196

Multiple Entries? ☑

Date of publication 1999

Assessment method North Carolina Coastal Region Evaluation of Wetland Significance (NC-CREWS)

Notes

Goals of method To predict the relative ecological significance of wetlands within their watershed & region using a GIS-based lanscape-scale procedure. Developed for wetland planning and overall wetland management, rather than for regulatory decisions.

Uses of method
wetland and land-use planning
overall wetland management
wetland acquisition priority rank
wetland restoration priority rank

Status of use applied

Regions of testing Carteret County, NC

Wetlands types tested

Results of testing NC-CREWS was developed based on field data collected from 400+ sites in Carteret County, NC.

Personnel requirements: Professional(s) who have training and experience in wetland science.

Time requirements: 3-9 days to evaluate a 14 digit watershed (5,000-50,000 acres). Preparing data for evaluation can take longer.

Training availability:

Proposed future revisions: NC-CREWS will be reviewed annually and updated as necessary. Major revisions will most likely occur on a five-year cycle.

Applicable wetland types: tidal and non--tidal wetlands in the North Carolina coastal area.

Functions/values assessed:
surface runoff storage
floodwater storage
shoreline stabilization

Indicators of functions/values

Regions of application: coastal North Carolina

Wetland types

Examples of method application: Applied to all wetland areas in NC's 20 coastal counties & planned application to counties w/in NC's

Strenths of method: Can directly compare wetlands from the same or different wetland class w/in the North Carolina coastal area.

Limitations of method: Developed for wetland planning and overall wetland management, rather than for regulatory decisions.

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☑ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

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Issue number n/a

Page(s) 196

Multiple Entries? ☑

Date of publication 1999

Assessment method Montana Wetland Field Evaluation Form (MT Form)

Notes

Goals of method To evaluate wetland functions and values when addressing highway and other linear projects (e.g., pipelines and transmission lines).

Uses of method Evaluation of wetland functions and values when addressing highway and other linear projects (e.g., pipelines and transmission lines.
May also be used for other applications (e.g., mitigation projects).

Status of use applied

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements: Professional(s) who have training and experience in wetland science.

Time requirements: 15-20 minutes to assess a 1 acre site (time dependant on availability of background info.)

Training availability:

Proposed future revisions: MDT plans to revise sections & computerize the MT Form during Fall/Winter 1998-99 w/assisstance from consultants, regulatory agencies, & MT Natural Heritage Program.

Applicable wetland types: wetlands in Montana

Functions/values assessed: habitat for federally listed, proposed, or candidate threatened or
endanged plants or animals

Indicators of functions/values

Regions of application: Montana

Wetland types

Examples of method application: MT Form has been used consistently in the last 2 yrs by the Montana Dept. of Transportation (MDT) &

Strenths of method: Can directly compare wetlands from the same or different wetland class within Montana.

Limitations of method: MT Form should not be used as a guide for design.

Opportunity variable are used, but upper limits are

☑ **Can directly compare wetlands within the same class?**

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☐ **Can be used as a guide for design?**

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Reference: n/a

Author(s) Candy C. Bartoldus

Publisher Environmental Concern Inc., St. Michaels, MD

Volume number n/a

Issue number n/a

Page(s) 196

Multiple Entries? ☐

Date of publication 1999

Assessment method Minnesota Rountine Assessment Method (MNRAM)

Notes

Goals of method To assess wetland functions in routine local, state, and federal permit applications, and for wetland planning assessment.

Uses of method routine local, state, and federal permit applications wetland planning assessment controversial projects where mitigation is proposed.

Status of use testing & applied

Regions of testing

Wetlands types tested

Results of testing Field testing was done in the development stage and in a limited number of training sessions for local governments.

Future testing to be done to assess MNRAM's value for regulatory permit decision making and planning.
Comparisons to other methods will also be part of future field testing.

Personnel requirements: Trained and experienced wetland professionals (preferably a diverse team)

Time requirements: 2-3 hours to assess a 1 acre site, assuming that the pre-field work has been done.

Training availability:

Proposed future revisions: Final version2.0 expected July 1998

Applicable wetland types: wetlands in Minnesota

Functions/values assessed: vegetation diversity/integrity
maintenance of hydrologic regime
flood/stormwater attenuation

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application: MNRAM has been applied to wetland planning (e.g., prioritizing & assessing wetlands for ordinance

Strenths of method: Can directly compare wetlands of the same type within the same wetland comparison domain.

Limitations of method: MNRAM should not be used as a guide to design.

Opportunity variable are used, but upper limits are

☑ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

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Volume number n/a

Issue number n/a

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Multiple Entries? ☑

Date of publication 1999

Assessment method WEThings

Notes

Goals of method To predict potential for individual species of wetland-dependant amphibians, reptiles, and mammals. Developed for New England state agencies.

Uses of method

Status of use applied

Regions of testing

Wetlands types tested

Results of testing Testing was limited to two species.

Personnel requirements: Field technicians with a working knowledge of wetlands and trained in the use of WEThings collect and process data. Professional biologists review and interpret results.

Time requirements: 1-2 hours to assess 1 acre site.

Training availability:

Proposed future revisions: WEThings and WEThings Birds are expected to be combined in a single computer program.

Applicable wetland types: All wetland types in the New England area (Maine, New Hampshire, Vermont, Massachusetts, Connecticut, & Rhode Island).
Possibly applicable to other states in the range of each species.

Functions/values assessed: habitat potential for wetland-dependant amphibians, reptiles, and mammals

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application: There is no data on the extent of use, but WEThings has reportedly been used on a variety of projects.

Strenths of method: Can directly compare wetlands w/in the New England area.

Limitations of method: WEThings should not be used as a guide for design because of the highly variable species data set.

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☐ **Can be used as a guide for design?**

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Author(s) Candy C. Bartoldus

Publisher Environmental Concern Inc., St. Michaels, MD

Volume number n/a

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Page(s) 196

Multiple Entries? ☑

Date of publication 1999

Assessment method Guidance for Rating the Values of Wetlands in North Carolina (NC Guidance)

Notes

Goals of method To rate freshwater wetlands when making decisions regarding 401 Water Quality Certifications.
A tool for evaluating wetland acquisition, restoration, and mitigation banks.

Uses of method To rate freshwater wetlands when making decisions regarding 401 Water Quality Certifications.
A tool for evaluating wetland acquisition, restoration, and mitigation banks.

Status of use applied

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements: Professional(s) who have schooling in environmental sciences.

Time requirements: 1 hour to assess a 1 acre site (not including time to gather information prior to assessment)

Training availability:

Proposed future revisions: Plans are to revise NC Guidance in 1998 by eliminating the recreation/education category & giving more equal weight to the other categories.

Some of the choices in the flow charts may be updated and revised.

Applicable wetland types: Freshwater wetlands in North Carolina (not applicable to storm channels).

Functions/values assessed: water storage
bank/shoreline stabilization
pollutant removal

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application: Used to evaluate a wide variety of projects (highways, commercial, residential) and enforcement actions.

Strenths of method: Can directly compare freshwater wetlands within North Carolina.

Limitations of method: NC Guidance should not be used as a guide for design.

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☐ **Can be used as a guide for design?**

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Issue number n/a

Page(s) 196

Multiple Entries? ☑

Date of publication 1999

Assessment method Wildlife Habitat Appraisal Procedure (WHAP)

Notes

Goals of method To provide a qualitative assessment of wildlife habitat. ,

Uses of method To evaluate impacts from water development projects.
To establish base line data prior to habitat changes.
To compare candidate area for land acquisition or mitigation.
To evaluate habitat quality and wildlife management potential.

Status of use applied

Regions of testing Texas

Wetlands types tested

Results of testing WHAP has been extensively field tested and used on a number of large and small projects statewide in Texas.

Personnel requirements: Experienced biologist and ability to identify dominant plants.

Time requirements: Less than 1 day for wetlands <1000 acres.
(10-15 minutes to assess 1 acre site)

Training availability:

Proposed future revisions: planned for 1999, with only minor revisions.

Applicable wetland types: Upland, bottomland, and wetland habitat in Texas.

Functions/values assessed: biological habitat components
protected and endagered species
acquisition and administration

Indicators of functions/values

Regions of application: Texas

Wetland types

Examples of method application: WHAP has been extensively field tested and used on a number of large and small projects statewide in

Strenths of method: Can directly compare habitats within Texas.

Individual component values can be used to

Limitations of method: WHAP should not be used as a guide for design.

Validated threshold values are not provided for

☑ **Can directly compare wetlands within the same class?**

☑ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

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Page(s) 196

Multiple Entries? ☑

Date of publication 1999

Assessment method New England Freshwater Wetlands Invertebrate Biomonitoring Protocol (NEFWIBP)

Notes

Goals of method To provide a standardized, cost-effective method for assessing the impact of urbanization on permanently flooded freshwater wetlands.

Uses of method To assess impact of urbanization on permanently flooded freshwater wetlands.
To inventory wetlands within a watershed.
To evaluate success of a restoration.
To monitor progress in created wetlands.
To guide watershed management for risk assessment.

Status of use testing & applied

Regions of testing Central CT
Cape Cod, MA

Wetlands types tested

Results of testing

Personnel requirements: Trained wetland ecologists with an aquatic entomology background.
Alternatively, a group leader with this expertise can train and coordinate volunteers working as team members.

Time requirements: 40-60 hours to assess 1-acre site (incl. planning, remote sensing, field work, lab work, data analysis, & summary - does not incl. writing of official report)

Training availability: Training workshops planned for 1999

Proposed future revisions: A draft revision is in review & may become the accepted procedure for training volunteer monitoring the New England region.
If accepted - used in training workshops planned in 1999 and 2000.

Applicable wetland types: Permanently flooded, non-tidal freshwater wetlands in the New England area.

Functions/values assessed: biological integrity

Indicators of functions/values habitat assessment score
total organisms

Regions of application:

Wetland types

Examples of method application: NEFWIBP has been used approx. 5 times during the last 2 years for watershed planning & management

Strenths of method: Can directly compare wetlands from the same classification w/in the same geographic region.

Limitations of method: Cannot directly compare wetlands from different habitats or different geographic regions.

☑ **Can directly compare wetlands within the same class?**

Title **A Comprehensive Review of Wetland Assessment Procedures: A Guide for Wetland Practitioners**

- [ ] Can directly compare wetlands from different classes?
- [ ] Can be used as a guide for design?

Reference: n/a

Author(s) Candy C. Bartoldus

Publisher Environmental Concern Inc., St. Michaels, MD

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Multiple Entries? ☑

Date of publication 1999

Assessment method Narragansett Bay Method (NBM)

Notes

Goals of method To evaluate salt marshes & wetlands that were formerly tidal for community planning, providing baseline info. for future restoration efforts & identifying areas needing increased protection.

Uses of method to provide baseline info. for future restoration efforts
to identify areas needing increased protection
**(see limitations)

Status of use applied

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements: Individuals with some knowledge of tidal marshes (e.g., local citizen groups, municipalities, concerned individuals), but not necessarily wetland ecologists.

Time requirements: 2-3 hours to assess a 1 acre site.

Training availability:

Proposed future revisions: NBM may be expanded to include riparian and freshwater wetlands within the next year.

Applicable wetland types: tidal salt marshed & brackish/freshwater wetlands that were formerly tidal in Narragansett Bay, RI

Functions/values assessed: ecological health of the zone of influence
ecological health of a salt marsh
tidal restrictions

Indicators of functions/values

Regions of application: Narragansett Bay, Rhode Island

Wetland types salt marsh

Examples of method application: NBM has been applied to most, if not all, Narragansett Bay salt marshes.

Strenths of method: Can directly compare tidal wetlands w/in Narragansett Bay, RI.

Limitations of method: NBM is not designed for use in detailed impact analysis on individual wetlands.

- [x] Can directly compare wetlands within the same class?
- [ ] Can directly compare wetlands from different classes?
- [x] Can be used as a guide for design?

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Author(s) Candy C. Bartoldus

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Assessment method New Hampshire Method (NH Method)

Notes

Goals of method To evaluate wetlands in planning, education, and wetland inventory.
**see limitations

Uses of method planning
education
wetland inventory.
**see limitations

Status of use applied

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements: Public officials and other who have some familiarity with wetlands, but who are not necessarily wetland specialists.

Time requirements: preparation: 1-3 days
assessment: 1/2 day (field) + 1 hour (office)

Training availability:

Proposed future revisions: none

Applicable wetland types: non-tidal wetlands in NH.

Functions/values assessed: ecological integrity
wetland wildlife habitat
finfish habitat

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application: townwide landuse planning (not for impact assessment)

Strenths of method: Can directly compare non-tidal wetlands in New Hampshire.

Limitations of method: NH Method is not for detailed impact analysis on individual wetlands.

☑ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **A Comprehensive Review of Wetland Assessment Procedures: A Guide for Wetland Practitioners**

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Assessment method Watershed-based Wetland Assessment Method for the New Jersey Pinelands (NJ Watershed Method)

Notes

Goals of method to assess watershed/wetland integrity and potential impacts effecting the long-term sustainability of wetland systems, by using a GIS and watershed-based approach.

Uses of method To assess watershed/wetland integrity.
To assess potential impacts on long term wetland sustainability.
To complete assessment of all Pinelands watersheds & associated wetlands.
To guide decisions regarding site-specific wetland buffer distance.

Status of use in development

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements: Professional(s) who have training/experience in NJ Pinelands wetlands and GIS development are required to implement the method.
Once the wetlands are classified in a study area, no expertise is required of the users of the data.

Time requirements: several months

Training availability:

Proposed future revisions: none planned - author recommends revisions before implementation

Applicable wetland types: non-tidal freshwater wetlands in NJ Pinelands

Functions/values assessed: watershed integrity
potential impacts

Indicators of functions/values

Regions of application: NJ Watershed was a demonstration project and has not been used in the NJ Pinelands.

Wetland types

Examples of method application:

Strenths of method: Could directly compare watersheds w/in NJ Pinelands if analysis of all wetland systems is completed.

Limitations of method: NJ Watershed Method is not appropriate for small site-specific projects, and should only be used to compare & rank landscape units.

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☐ **Can be used as a guide for design?**

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Assessment method Pennsylvania Modified 1980 Habitat Evaluation Procedure (PAM HEP)

Notes

Goals of method To assess baseline fish and wildlife habitat conditions.
To determine direct impacts of project construction on these conditions.
To develop a mitigation plan to offset these impacts.

Uses of method To assess baseline fish and wildlife habitat conditions.
To determine direct impacts of project construction on these conditions.
To develop a mitigation plan to offset these impacts.

Status of use applied

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements: Team w/designated voting members from each of the following: US FWS, PA Fish Commission, PA Game Commission, applicant/action agency.
Individuals must have training & experience in basic principles of fisheries and/or wildlife bio. & be certified in HEP.

Time requirements: preparation: 8 hours
assessment: 8 hours to assess a 1 acre site

Training availability:

Proposed future revisions: Yes - but resources have not yet been allocated.
Proposed changes would be in the form of WHAMS (i.e., eliminate Relative Value index).

Applicable wetland types: Most terrestrial, wetland, and aquatic habitats in PA.

Functions/values assessed: habitat suitability of selected fish, wildlife, or invertebrates

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application: PAM HEP has been used on a variety of projects:
small wetlands replacement

Strenths of method: Can directly compare habitats w/in PA [not sure if this means only w/in the same habitat type or between different habitat types].

Limitations of method:

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Assessment method Wisconsin Rapid Assessment Methodology (WI RAM)

Notes

Goals of method To assess wetland functions in routine Section 404 permit applications.

Uses of method For regulatory assessment.
For screening 2 special area management plans
For screening a number of remediation projects.

Status of use applied

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements: Professional(s) who have training and experience in wetland science.

Time requirements: four hours to assess 1 acre site

Training availability:

Proposed future revisions: An amphibian aupplement is being prepared with planned distribution in August 1998.

Applicable wetland types: wetlands in Wisconsin

Functions/values assessed: floral diversity
wildlife habitat
fishery habitat

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application: WI RAM has been routinely used since 1992 for regulatory assessment.

Strenths of method: Can directly compare wetlands within WI

Limitations of method: WI RAM should not be used as a guide for design.

Validated threshold values are not provided for

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Assessment method Process for Assessing Proper Functioning Condition (PFC)

Notes

Goals of method To assess whether a riparian-wetland area is functioning properly.

Uses of method To restore and maintain riparian-wetland area on BLM-managed lands.
To develop management strategies.

Status of use applied

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements: Interdisciplinary team including a biologist, and specialists in vegetation, soils, and hydrology.

Time requirements: preparation: 1-3 days
assessment: 1/2 hour to assess a 1acre site

Training availability:

Proposed future revisions: none planned
(last updated in 1998)

Applicable wetland types: riparian-wetlands in the US

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types riparian-wetlands
lentic wetlands

Examples of method application: US FS - used PFC to assess condition of riparian-wetlands on public land

Strenths of method: Can directly compare wetlands from the same or different wetland class w/in the same or different geographic area.

Limitations of method: PFC is designed to inventory wetland-riparian areas, not specific project sites.

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Assessment method Wetland Assessment: A Regulatory Assessment Method (RA)

Notes

Goals of method To provide guidance on how to gather and analyze information about functions/values and other factors (I.e., zoning issues, natural hazards) as needed to meet regulatory decision-making needs.

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements: Professional working in federal, state, or local wetland regulatory program.

Time requirements: variable

Training availability:

Proposed future revisions: Fall 1998.

Applicable wetland types: all wetland types in the US

Functions/values assessed: variety of functions depending upon wetland class

Indicators of functions/values

Regions of application: none

However, RA has been used used with existing

Wetland types none

Examples of method application: none

Strenths of method: Direct comparison of different wetland types is to be determined by the evaluator and by the rules of the selected assessment procedure.

Limitations of method: By itself, the RA Method cannot be used as a guide to design because it does not provide criteria for assessing functions/values.

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Assessment method A Rapid Procedure for Assessing Wetland Functional Capacity (Rapid Assessment Procedure) (RAP)

Notes

Goals of method To provide a procedure for assessing functional capacity of wetlands in the glaciated northeast and midwest.

Uses of method To assess functional capacity of wetlands in the glaciated northeast and midwest
To serve as a template and provide a step by step process for developing rapid assessment procedures for various regions of the continental Uniter States.

Status of use applied

Regions of testing

Wetlands types tested

Results of testing Procedure was field tested at various stages during development.

Personnel requirements: Two person team of experienced wetland scientists - one with soils/hydrology background and one competent in plant identification and ecology.

Time requirements: development: several weeks of work
assessment: 1-2 hours to assess a 1 acre site

Training availability:

Proposed future revisions: none at this time.

Applicable wetland types: HGM classes in glaciated northeast & midwest: depressional, slope, lacustrine fringe, extensive peatland, flat, & riverine (applicable to all continental US wetlands but models are not developed for other regions)

Functions/values assessed: glaciated northeast & midwest:
modification of groundwater discharge
mod. of groundwater recharge

Indicators of functions/values

Regions of application: New York (1998)

Wetland types

Examples of method application: several small routine regulatory projects

Strenths of method: Can directly compare wetlands w/in the same regional class as defined by the models.

Limitations of method: Cannot directly compare wetlands from different classes or different regions.

☑ **Can directly compare wetlands within the same class?**

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Assessment method Synoptic Approach for Wetlands Cumulative Effect Analysis (Synoptic Approach)

Notes

Goals of method To provide a framework for making comparisons between landscape subunits (e.g., watersheds, ecoregions, or counties) so that impacts to wetlands can be considered in management decisions.

Uses of method watershed planning
prioritizing areas for restoration or protection

Status of use

Regions of testing Pennsylvania
Oregon

Wetlands types tested

Results of testing Most applications of the Synoptic Approach have been for research and development, and only include hypothetical applications.

Arkansas: to support prioritization of restoration projects
EPA Region 7: to support wetland protection efforts

Personnel requirements: Team of individuals including a resource manager, resource specialist (e.g., permit reviewer), and technical analyst.

Time requirements: 6 mos - 2 yrs (Synoptic Approach is not appropriate for small projects - it should only be used to compare and rank landscape units)

Training availability:

Proposed future revisions: revisions due 1998

Applicable wetland types: all wetland types in the US

Functions/values assessed: function
habitat
water quality

Indicators of functions/values

Regions of application: Pennsylvania (4 watersheds)
Oregon

Wetland types

Examples of method application: Used 3 times in the last 2 years.

Most applications have been for

Strenths of method: Could enable direct comparison of landscape subunits w/in a geographic area (e.g., watersheds w/in a state).

Limitations of method: Synoptic Approach is not appropriate for small projects - it should only be used to compare and rank landscape units.

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

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Assessment method Wildlife Community Habitat Evaluation (WCHE)

Notes

Goals of method To evaluate the quality of wildlife habitat in deciduous palustrine forested wetlands in Maryland.

Uses of method impact assessment
resource management

Status of use

Regions of testing

Wetlands types tested

Results of testing Study conducted of the relation of the tract variables to the richness of forest interior birds in 18 Breeding Bird Census plots in eastern deciduous forests was conducted to provide a test of several important model hypotheses.

Personnel requirements: Biologist experienced with Maryland deciduous palustrine forested wetlands.

Time requirements: variable

Training availability:

Proposed future revisions:

Applicable wetland types: deciduous palustrine forested wetlands in Maryland

Functions/values assessed: tract suitability
plot suitability
native richness

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method: Can directly compare deciduous palustrine forested wetlands within Maryland.

Limitations of method:

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Assessment method Technique for the Functional Assessment of Virginia Coastal Plain Nontidal Wetlands (VIMS Method)

Notes

Goals of method To assess wetland functions in conjunction with conducting an inventory of non-tidal wetlands in VA.

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements: Professional(s) with schooling in environmental sciences.

Time requirements: approx. 1/2 day per wetland

Training availability:

Proposed future revisions: none.

Applicable wetland types: non-tidal wetlands in Virginia's coastal plain

Functions/values assessed:
flood storage
storm flow modification
nutrient retention & transformation

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application: Used most extensively by VIMS for inventory and research (approx. 50 times in last 2 years).

Strenths of method: Can directly compare non-tidal wetlands within Virginia's coastal plain.

Limitations of method: VIMS Method should not be used as a guide for design.

☑ **Can directly compare wetlands within the same class?**

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Assessment method Coastal Method

Notes

Goals of method To evaluate wetlands for community planning, education, and wetland inventory; but not for detailed impact analysis on individual wetlands.

Uses of method
community planning
restoration prioritization
development of marsh system management plan
implementation of management plan

Status of use applied

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements: Individuals who have some knowledge of tidal marshes, but not necessarily wetland ecologists.

Time requirements: One to three days of preparation.
One hour to assess a 1 acre site

Training availability:

Proposed future revisions: Reprinted with minor revisions (due summer 1998)

Applicable wetland types: Tidal marshes in New Hampshire

Functions/values assessed:
ecological integrity of the eval. unit
ecological integrity of the zone of influence
shoreline anchoring

Indicators of functions/values

Regions of application: New Hampshire

Also adapted for use in Maine (ME tidal

Wetland types

Examples of method application: The coastal method has been applied primarily to:
1. community planning

Strenths of method: Can directly compare vegetated tidal wetlands within New Hampshire.

Limitations of method: Not for detailed impact analysis on individual wetlands.

☑ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

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Assessment method M-WRAP (see also WRAP, E-WRAP)

Notes

Goals of method A modified version of WRAP designed for use in reviewing mitigation banks and to aid in determining the number of credits.

Uses of method To review mitigation banks
To aid in determining the number of credits

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

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Assessment method Connecticut Method (CT Method)

Notes

Goals of method To evaluate wetlands in planning, education, and wetland inventory; but not for detailed impact analysis on individual wetlands.

Uses of method To note relative value of all wetlands within a town or selected watersheds in CT.

Status of use applied

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements: Public officials and others who have some familiarity with wetlands, but who are not necessarily wetland specialists.

Time requirements: One to three days of preparation by public official.
One hour to assess a 1 acre site.

Training availability:

Proposed future revisions: none

Applicable wetland types: Nontidal wetlands in Connecticut.

Functions/values assessed:
flood control
ecological integrity
wildlife habitat

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application: The CT Method has been used primarily for land use planning. The extent of use is unknown.

Strenths of method: Can directly compare nontidal wetlands within CT.

Limitations of method: The CT Method should not be used as a guide for design.

☑ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

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Assessment method Wetland Functions and Values: A Descriptive Approach (Descriptive Approach)

Notes

Goals of method To identify and display wetland functions and values for highway and other projects reviewed under the 404 Regulatory Program.

Uses of method

Status of use applied

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements: Interdisciplinary team of professionals from the U.S. Army Corps of Engineers (COE), State, other federal agencies, and their applicant.

Time requirements: Two hours to assess 1 acre site, including gathering information (e.g., obtaining USGS quads and aerial photos) and time at the site.

Training availability:

Proposed future revisions: none

Applicable wetland types: All wetland types within boundaries of COE New England District.

Functions/values assessed:
groundwater recharge/discharge
floodflow alteration
fish & shellfish habitat

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application: The approach has been used on a variety of projects including highway and commercial

Strenths of method: Can directly compare wetlands within geographic boundaries of the COE New England District.

Limitations of method: The Descriptive Approach should not be used as a guide to design.

☑ **Can directly compare wetlands within the same class?**

☑ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide to design?**

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Assessment method Evaluation for Planned Wetlands (EPW)

Notes

Goals of method To assess wetland functions and to determine whether a planned wetland has been adequately designed to achieve defined function goals. EPW can also be used in other regulatory, planning, and management situations.

Uses of method To determine whether a planned wetland has been adequately designed to achieve defined function goals. EPW can also be used in other regulatory, planning, and management situations.

Status of use applied

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements: Professional(s) who have training and experience in wetland science.

Time requirements: Preparation time variable. Assessment - one hour per 1 acre site.

Training availability:

Proposed future revisions: A draft floodflow alteration model has been prepared, but not published.

There are plans to revise the shoreline bank erosion control model to include separate models for lake/coastal fringe and riverine areas.

Applicable wetland types: All wetland types in the United States

Functions/values assessed:
shoreline bank erosion control
sediment stabiliaztion
water quality

Indicators of functions/values

Regions of application:
Staten Island, NY
Virginia
Maryland

Wetland types

Examples of method application:
large projects (e.g., reservoirs and highways)
watershed planning in Staten Island,

Strenths of method: Can directly compare wetlands within the same wetland class.

Limitations of method: Cannot directly compare wetlands from different classes, although the results from assessing different wetland types can be used to aid in

☑ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☑ **Can be used as a guide for design?**

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Assessment method Habitat Assessment Technique (HAT)

Notes

Goals of method To document the quality and quantity of available breeding bird habitat during regulatory actions and when evaluating areas for acquisition.

Uses of method guide for site selection
selection of restoration/creation sites
ranking of wetlands for acquisition

Status of use applied

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements: Ornithologist (field observer competent in bird identification)

Time requirements: 3-5 days of preparation only for the first site.
<1 hour to assess 1 acre site.

Training availability:

Proposed future revisions: HAT will be used to evaluate farmed wetlands as part of an EPA farmed wetlands project in Kansas (beginning Spring 1998)

Applicable wetland types: Developed for wetlands, but applicable to any aquatic or terrestrial habitat.

Functions/values assessed: breeding bird habitat quality
(in theory, any taxa could be used)

Indicators of functions/values

Regions of application: Delaware
Indiana

Wetland types

Examples of method application: Used in Delaware
Used in Indiana to rank wetlands for acquisition

Strenths of method: Incorporates diversity/rarity of wetland-dependant species and wetland size into measurement of habitat quality.

Limitations of method: HAT should not be used as a guide to design, but may be useful in guiding site selection.

☑ **Can directly compare wetlands within the same class?**

☑ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

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Assessment method Habitat Evaluation Procedure (HEP)

Notes

Goals of method To document the quality and quantity of available habitat for selected wildlife species.

Uses of method wildlife habitat assessments (including both baseline and future conditions)
trade-off analyses
compensation analyses

Status of use applied

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements: Team with designated voting members from each of the review agencies (e.g., FWS, COE, EPA, State, & applicant/action agency). Individuals must have training & experience in basic principles of fisheries and/or wildlife biology, and be certified in HEP.

Time requirements: 1-3 days of preparation assessment: variable (1-10 days depending on habitat complexity and political sensitivity)

Training availability: HEP certification

Proposed future revisions: New species models are being prepared. Software computer programs are currently being prepared for existing HEP models.

Applicable wetland types: Most terrestrial, wetland, and aquatic habitats in the US

Functions/values assessed: habitat suitability for selected fish, wildlife, or invertebrates

Indicators of functions/values

Regions of application: throughout the US

Wetland types

Examples of method application: HEP applied to a variety of projects (e.g., oil wells, highway, golf course development, mining, & reservoirs).

Strenths of method: Measures habitat suitability of a sample plot relative to optimum habitat suitability for a species in a region.

Limitations of method:

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☑ **Can be used as a guide for design?**

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Assessment method Hydrogeomorphic Approach (HGM)

Notes

Goals of method To assess wetland functions in the 404 Regulatory Program as well as other regulatory, planning, & management situations.

Uses of method To assess wetland functions in the 404 Regulatory Program as well as other regulatory, planning, & management situations.

Status of use in development & applied

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements: Interdisciplinary team of experts required during development phase.
Application phase should be done by individual(s) who have personal knowledge and field experience with the regional wetland subclass under consideration.

Time requirements: development: months of work for each regional wetland subclass
application: 1-2 hours per 1 acre site

Training availability:

Proposed future revisions: No plans to revise the concept of HGM. Models for individual regional wetland subclasses are being prepared and will continue as dictated by needs and funding.

Applicable wetland types: All wetland types in the US; however, not all assessment models are developed.

Functions/values assessed: (depends on wetland regional subclass)

Includes functions related to:

Indicators of functions/values

Regions of application: Approved guidebooks:
Western Kentucky
prairie potholes

Wetland types prairie potholes

Examples of method application: Western Kentucky models - used on a large mining ADID (Advanced Identification) project.

Strenths of method: Measures functional capacity of a site relative to wetlands from the same regional wetland subclass.

Limitations of method: Cannot directly compare wetlands from different subclasses or different regions.

☑ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☑ **Can be used as a guide for design?**

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Author(s) Candy C. Bartoldus

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Multiple Entries? ☑

Date of publication 1999

Assessment method Method for Assessment of Wetland Function (MDE Method)

Notes

Goals of method To assess relative function of several wetlands for broad area planning using available data sources.

Uses of method broad area planning

Status of use applied

Regions of testing Red Run, MD (Piedmont)
Big Annemessex River, MD (coastal plain)

Wetlands types tested

Results of testing

Personnel requirements: Informed lay persons dealing with watershed management issues, particularly county planners.

Time requirements: Approx. 1 week to assess wetlands within a planning region (method is not applicable to single small projects).

Training availability:

Proposed future revisions: Yes, but no date has been set.

Applicable wetland types: Non-tidal palustrine vegetated wetlands in Maryland

Functions/values assessed: ground water discharge
flood flow attenuation
modification of water quality

Indicators of functions/values

Regions of application: Maryland

Wetland types

Examples of method application: The MDE Method has been used for three planning studies (watershed or local use plans) during the last 2

Strenths of method: Can directly compare nontidal wetlands in Maryland w/in the same wetland class and stream order.

Limitations of method: MDE Method is not applicable to single small projects.

☑ **Can directly compare wetlands within the same class?**

☑ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **A Comprehensive Review of Wetland Assessment Procedures: A Guide for Wetland Practitioners**

Reference: n/a

Author(s) Candy C. Bartoldus

Publisher Environmental Concern Inc., St. Michaels, MD

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Page(s) 196

Multiple Entries? ☑

Date of publication 1999

Assessment method E-WRAP (see also WRAP, M-WRAP)

Notes

Goals of method A modified version of WRAP designed for use in assessing estuarine systems.

Uses of method

Status of use in development

Regions of testing

Wetlands types tested

Results of testing As of August 1998, E-WRAP had not been field tested.

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

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Date of publication 1999

Assessment method Maine Citizens Tidal Marsh Guide (ME Tidal Method)

Notes

Goals of method To evaluate wetlands for community planning, identifiying restoration opportunities, education, and wetland inventory

Uses of method
evaluation wetlands for community planning
identification of restoration opportunities
education
wetland inventory
**(see limitations)

Status of use applied

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements: Individuals who have some knowledge of tidal marshes (e.g., conservation commission, planning boards, or interested individuals), but not necessarily wetland ecologists.

Time requirements: preparation: 1-3 days
application: one-half day for field time, office write-up & analysis. Could do 100 acres in 1-2 days.

Training availability:

Proposed future revisions: none

Applicable wetland types: vegetated tidal marshes in Maine

Functions/values assessed:
ecological integrity of the marsh system
ecological integrity of the zone of influence
wildlife, finfish, and shellfish habitat

Indicators of functions/values

Regions of application:

Wetland types tidal marshes

Examples of method application: ME Tidal has been used for conservation planning by local communities and non-governmental

Strenths of method: Can directly compare vegetated tidal wetlands within Maine.

Limitations of method: ME Tidal Method not to be used for detailed impact analysis on individual wetlands.

☑ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

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Reference: n/a

Author(s) Candy C. Bartoldus

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Date of publication 1999

Assessment method A Method for Assessing the Functions of Wetlands (Hollands-Magee Method)

Notes

Goals of method To assess wetland functions in the Section 404 regulatory program as well as other regulatory, planning, and management situations.

Uses of method To assess wetland functions in the Section 404 regulatory program as well as other regulatory, planning, and management situations.

Status of use applied

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements: A geologist/hydrologist and a botanist/ecologist experience in wetlands.

Time requirements: 3-4 hours per 1-acre site.

Training availability:

Proposed future revisions: Rapid Assessment Procedure is the current revision

Applicable wetland types: Nontidal wetlands in the glaciated Northeast and Midwest

Functions/values assessed: biological
hydrologic support
groundwater

Indicators of functions/values

Regions of application: Massachusetts, New Hampshire, Maine
Wisconsin
New England, New York

Wetland types

Examples of method application: MA, NH, ME - 22 townwide wetland assessment/mapping projects (1975-81)

Strenths of method: Can directly compare nontidal wetlands within New England, some midwestern states, and possibly other areas.

Limitations of method: The Hollands-Magee Method should not be used as a guide for design.

☑ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **A Comprehensive Review of Wetland Assessment Procedures: A Guide for Wetland Practitioners**

Reference: n/a

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Date of publication 1999

Assessment method Wetland Rapid Assessment Procedure (WRAP) (see also M-WRAP, E-WRAP)

Notes

Goals of method To provide a consistent, timely regulatory for evaluating freshwater wetlands that have been created, enhanced, preserved, or restored through the regulatory programs of the S. Florida Water Management District & the Environmental Resource permit process.

Uses of method

Status of use applied

Regions of testing

Wetlands types tested

Results of testing 200+ sites were tested during development

Statistical analysis of the data indicate that WRAP is highly repeatable and that there is no multicollinearity and correlation among variables.

Personnel requirements: Professionals with an understanding of functions in Florida freshwater ecosystems and familiar with flora and fauna with respect to specific ecosystems.

Time requirements: 45mins-1hour to assess 1 acre site.

Training availability:

Proposed future revisions: There will be further revisions w/in the next 5 years.
(WRAP is in its 15th version in 5 years)

Applicable wetland types: freshwater wetlands in FL

Functions/values assessed: wildlife utilization
overstory/shrub canopy of desirable species
wetland vegetative ground cover of desirable

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application: review of mitigation banks
review of permit actions (US COE)
permit applications submitted by

Strenths of method: WRAP contains some information that can be used for site plan development.

Limitations of method: A particular system is evaluated on its own attributes and is not to be compared to a different type of system.

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **A Comprehensive Review of Wetland Assessment Procedures: A Guide for Wetland Practitioners**

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Date of publication 1999

Assessment method Wetland Quality Index (WQI)

Notes

Goals of method To determine the amount and kind of mitigation that would compensate for ecological wetland impacts within the Everglades.

Uses of method To determine the amount and kind of mitigation that would compensate for ecological wetland impacts within the Everglades.

Status of use applied

Regions of testing Weston, FL

Wetlands types tested

Results of testing WQI was field tested in Weston by 4 wetland scientists.

Agreement was good, and guidelines for decisions were refined to improve those areas where scoring was inconsistent.

Personnel requirements: Experienced ecologist and hydrologist.

Time requirements: 1 hour to assess 1 acre site (w/out available data or seasonal conditions - upto 1 year to obtain sufficient information)

Training availability:

Proposed future revisions: none, but there are plans to publish the WQI.

Applicable wetland types: Freshwater wetlands in the Everglades, FL

Functions/values assessed: wetland quality

Indicators of functions/values aquatic prey base abundance
aquatic prey base diversity

Regions of application: Weston, FL

Wetland types

Examples of method application: WQI was developed for a large (2500+ acres) residential development (Weston, FL) in a

Strenths of method: Can directly compare freshwater wetlands w/in the Florida Everglades.

Limitations of method: WQI should not be used as a guide for design.

Validated threshold values are not provided for

☑ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **A Comprehensive Review of Wetland Assessment Procedures: A Guide for Wetland Practitioners**

Reference: n/a

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Date of publication 1999

Assessment method Index of Biological Integrity (IBI)

Notes

Goals of method To assess the biological integrity of a habitat using samples of living organisms.
To evaluate the consequences of human actions on biological systems.

Uses of method To establish use designations for water bodies, biological water quality standards, or goals for restoration.
To be used as a guide for selection of restoration/creation sites.

Status of use development

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements: Biologists trained and experienced with biota being assessed (e.g., invertebrates, fish).

Time requirements: development: months of work for each habitat type assessment: one-half day of field work & one-half day of lab work depending on taxa selected

Training availability:

Proposed future revisions: IBI is in development for wetlands and has not been applied in a regulatory context.

Several states are developing IBIs for their wetlands, including Minnesota, Ohio, and North Dakota.

Applicable wetland types: variety of habitats including streams, lakes, and wetlands

Functions/values assessed: biological condition

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method: Can directly compare wetlands within the same class within the same geographic region.

Limitations of method: Cannot directly compare wetlands from different classes or similar classes from different regions.

☑ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ Can be used as a guide for design?

Title **A Comprehensive Review of Wetland Assessment Procedures: A Guide for Wetland Practitioners**

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Date of publication 1999

Assessment method Interim HGM

Notes

Goals of method To assess wetland functions when addressing minimal effect or mitigation request under the 1996 Farm Bill. When models are developed into approved HGM models, they may also be used in the 404 Regulatory Program.

Uses of method To assess wetland functions when addressing a minimal effect or mitigation request under the 1996 Farm Bill. When the models are developed into approved HGM models, then they may also be used in the 404 Regulatory Program.

Status of use in development & applied

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements: development: interdisciplinary team of experts application: individual(s) with personal knowledge and field experience with the regional wetland subclass under consideration

Time requirements: development: months of work for a regional subclass assessment: 1-2 hours to assess a 1 acre site

Training availability:

Proposed future revisions: Models for individual regional wetland subclasses are being prepared & will continue to be prepared as dictated by needs & funding.
Draft Interim HGM models will be revised into approved HGM Approach models after calibration with reference wetlands.

Applicable wetland types: All wetland types in the US; however, not all assessment models are developed.

Functions/values assessed: (depends on regional subclass)

Includes functions related to:

Indicators of functions/values

Regions of application: Draft Interim HGM models have been completed for:

Wetland types

Examples of method application: Interim HGM models have been used on minimal effect determinations and Farm Bill related

Strenths of method: Can compare wetlands within the same regional subclass.

Limitations of method: Cannot directly compare wetlands from different regional subclasses or different regions.

☑ **Can directly compare wetlands within the same class?**

- [ ] Can directly compare wetlands from different classes?
- [x] Can be used as a guide for design?

Title **A Comprehensive Review of Wetland Assessment Procedures: A Guide for Wetland Practitioners**

Reference: n/a

Author(s) Candy C. Bartoldus

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Date of publication 1999

Assessment method Indicator Value Assessment (IVA)

Notes

Goals of method To provide separate estimates of the performance of socially important functions within a wetland.
To provide an estimate of the relative value of that wetland within a planning region.

Uses of method To assess possible impacts from different development scenarios.
To identify compensation needs within a planning region.
To assess the potential of different wetlands for enhancement.

Status of use in development & applied

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements: A group of experts knowledgeable of the wetlands in the planning region or watershed.

Time requirements: development: 3-5 days of work by a scientific committee & 2-3 meetings of an advisory committee assesment: 1-4 hours to assess a 1 acre site

Training availability:

Proposed future revisions: none

Applicable wetland types: All wetland types in the US; however, not all assessment models are developed.

Functions/values assessed: A variety of wetland functions and values, the list of which depending upon the wetland study area.

Indicators of functions/values

Regions of application: New Jersey
Washington

Wetland types

Examples of method application: Hackensack Meadowlands Special Area Management Plan (SAMP), NJ
Mill Creek SAMP, WA

Strenths of method: Can directly compare wetlands within the same geopraphic area (e.g., watershed, planning area). Wetlands can be from the

Limitations of method: Due to the limited amount of published information, it is difficult to determine if IVA can be used as a guide for design; however, it appears

☑ **Can directly compare wetlands within the same class?**

☑ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title A Comprehensive Review of Wetland Assessment Procedures: A Guide for Wetland Practitioners

Reference: n/a

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Assessment method Oregon Freshwater Assessment Methodology (OFWAM)

Notes

Goals of method To evaluate wetlands in planning, education, and wetland inventory. **see limitations

Uses of method planning
education
wetland inventory.
**see limitations

Status of use applied

Regions of testing

Wetlands types tested

Results of testing Field testing was done during initial development and revised for the 2nd edition (1996).

Personnel requirements: Public officials and others familiar with wetlands, but who are not necessarily wetland specialists. These individuals must have received training in OFWAM.

Time requirements: preparation: 1-3 days
assessment: 2 hours to assess 1 acre site.

Training availability:

Proposed future revisions: none

Applicable wetland types: freshwater wetlands in Oregon

Functions/values assessed: wildlife habitat
fish habitat
water quality

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application: Applied in at least 22 comprehensive city-wide wetland inventories to date.

Strenths of method: Can directly compare freshwater wetlands w/in a planning area.

Limitations of method: OFWAM is not for detailed impact analysis on individual wetlands.

☑ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **A Comprehensive Review of Wetland Assessment Procedures: A Guide for Wetland Practitioners**

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Date of publication 1999

Assessment method Models for Assessment of Freshwater Wetlands (Larson Method)

Notes

Goals of method To assess wetland functions in planning situations.

Uses of method local, county, & statewide inventories and planning
state regulatory decision-making**(see limitations)
impact assessment
open space acquisition

Status of use applied

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements: Professionals who have schooling in environmental sciences . A trained hydrogeologist is required to perform higher level assessments on groundwater potential.

Time requirements: 5-8 hours, including a site visit, assuming availability of recent, large-scale aerial photos & either a surficial geology map or soil survey

Training availability:

Proposed future revisions: none

Applicable wetland types: Freshwater non-tidal wetlands in Massachusetts. Wildlife and visual-cultural submodels are also applicable to the northeast US.

Functions/values assessed: wildlife value (Golet submodel)
groundwater potential (Heeley-Motts submodel)
visual-cultural value (Smardon-Fabos submodel)

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application: used in revised form in a variety of projects including:
local, county, & statewide

Strenths of method: Can directly compare freshwater wetlands within MA and other areas in the glaciated northeast.

Limitations of method: **Larson Method is no longer recommended for regulatory or management purposes due to faulty assumption & lack of justification for comparisons

☑ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **A Comprehensive Review of Wetland Assessment Procedures: A Guide for Wetland Practitioners**

Reference: n/a

Author(s) Candy C. Bartoldus

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Date of publication 1999

Assessment method Washington State Wetland Function Assessment Method (WAFAM)

Notes

Goals of method To assess function at individual wetlands.
To meet regulatory and nonregulatory needs w/in the existing management framework of Washington state.

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing 1997 - data was collected at 88 reference sites on 60 different environmental characteristics, and used to calibrate the models

1998 - calibrated models were tested by approx. 40 individuals

Personnel requirements: Technical wetland experts and those with a strong background in wetlands science.
These individuals should be trained in WAFAM.

Time requirements: development: 15 months
assessment: 2-4 hours to assess 1 acre site

Training availability:

Proposed future revisions: none yet scheduled.

Applicable wetland types: In lowlands of western Washington: vegetated riverine (flow-through & impounding) depressional wetlands
Models are being developed for 3 subclasses of depressional wetlands in the Columbia basin.

Functions/values assessed: sediment removal
nutrient removal
metals & toxic organic removal

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method: Can directly compare wetlands within the same subclass.

Limitations of method: Cannot directly compare wetlands from different subclasses or different regions.

☑ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☑ **Can be used as a guide for design?**

Title A Comprehensive Review of Wetland Assessment Procedures: A Guide for Wetland Practitioners

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Multiple Entries? ☐

Date of publication 1999

Assessment method Wetland Value Assessment Methodology (WVA)

Notes

Goals of method To quantify changes in habitat quality and quanitity that are projected to occur as a result of proposed wetland enhancement projects.
Developed specifically to evaluate proposals submitted for funding under the CWPPRA.

Uses of method To evaluate proposals submitted for funding under the Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA).

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements: Professional(s) who have training and experience in the basic principles of coastal wetlands, and coastal fish and wildlife habitat.

Time requirements: approx. 1 hour to assess 1 acre site

Training availability:

Proposed future revisions: anticipated, but no planned schedule (models have been revised several times since development in 1991)

Applicable wetland types: Coastal Louisiana wetland types: fresh/intermediate marsh, brackish marsh, saline marsh, bottomland hardwoods, & fresh swamp

Functions/values assessed: habitat suitability

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application: To evaluate 50-60 CWPPRA coastal restoration projects over the last 2 years.

Strenths of method: Can directly compare area within the same wetland type.

Limitations of method: For regulatory projects, comparisons are only made within wetland type because compensation for ipacts usually must be made with the same wetland

☑ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☑ **Can be used as a guide for design?**

Title **A GIS-based Landscape Scale Wetland Functional Assessment Procedure**

Reference: http://www.wes.army.mil/el/workshop/FA2-1.html

Author(s) James E. Wuenscher
Lori A. Sutter

Publisher

Volume number

Issue number

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Multiple Entries? ☐

Date of publication

Assessment method GIS-based Landscape Scale Wetland Functional Assessment Procedure

Notes Divides wetlands into both hydrogeomorphic classes and vegetative cover classes.

Goals of method

Uses of method

Status of use

Regions of testing North Carolina coastal areas

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed: water quality
hydrology
habitat

Indicators of functions/values wetland type
wetland size
soil characteristics

Regions of application:

Wetland types

Examples of method application:

Strenths of method: Allows for functional assessment of wetlands over large geographic regions for planning purposes.

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **A hydrogeomorphic assessment of middle-elevation riparian vegetation, central Arizona**

Reference: Dissertation Abstracts International

Author(s) Thad Aaron Wasklewicz

Publisher Dissertation Abstracts International

Volume number 57-10

Issue number section B

Page(s) 6150

Multiple Entries? ☐

Date of publication

Assessment method HGM

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **A Method for Assessing Hydrologic Alteration Within Ecosystems**

Reference: http://www.wes.army.mil/el/workshop/FA1-5.html

Author(s)
Brian D. Richter
Jeff V. Baumgartner
Jennifer Powell
David P. Braun

Publisher

Volume number

Issue number

Page(s)

Multiple Entries? ☐

Date of publication

Assessment method Indicators of Hydrologic Alteration (IHA)

Notes

Goals of method To assess the degree of hydrologic alteration attributable to human impacts within an ecosystem.

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed: hydrology

Indicators of functions/values 32 parameters organized into 5 groups.

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method: Intended to be used in conjunction with other ecosystem metrics.

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **A method for assessing the functions of wetlands**

Reference: Proceedings of the National Wetland Assessment Symposium, Portland, Maine, June 1985

Author(s) Garrett Hollands
Dennis W. McGee

Publisher Jon A. Kusler and Patricia Riexinger (eds.)

Volume number

Issue number

Page(s)

Multiple Entries? ☐

Date of publication 1985

Assessment method A Method for Assessing the Functions of Wetlands (Hollands-Magee Method)

Notes

Goals of method

Uses of method To provide wetland inventory data for the regulatory agency

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements: two-person team consisting of a geologist/hydrologist and botanist/ecologist experienced in wetlands

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed: wildlife habitat
hydrologic support
groundwater

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method: fast, cost-effective, and easily applied

results compare w/those of the FHWA method

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **A method for assessing wetland characteristics and values**

Reference: Landscape Planning

Author(s) Anne D. Marble
Meir Gross

Publisher

Volume number 11

Issue number

Page(s) 1-17

Multiple Entries? ☐

Date of publication 1984

Assessment method Method for Assessing Wetland Characteristics and Values

Notes This method is based on the assumption that physical characteristics and functional attributes of wetlands vary predictably in relation to topographic position in the landscape.

Goals of method To classify and evaluate the relative importance of inland wetlands in providing wildlife habitat, flood control, and imporvement to surface water.
To provide information on wetland values which cannot be simply gathered and easily assessed, requiring only available data and a minimum of resources.

Uses of method To provide local decision-makers with readily accessible comparative information on wetland values.

Status of use

Regions of testing 385 wetlands within a 22 square mile area of New Canaan, CT

Wetlands types tested wooded swamps, shrub swamps, deep marshes, and

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: inland wetlands with one of three landscpae position categories: valley, hillside, or hilltop

Functions/values assessed: erosion and sediment control (surface water rpotection)
flood control

Indicators of functions/values erosion and sediment control
- the erodiability of the soils
adjacent to the wetlands

Regions of application:

Wetland types

Examples of method application:

Strenths of method: Information on each of the wetland values was readily available and in an understandable format.

Limitations of method: This methos is not intended to be the only tool by which to evaluate wetlands; it is meant to provide preliminary and comparative inofmration on

☑ **Can directly compare wetlands within the same class?**

☑ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **A Method for the Quantification of Edge and the Spatial Arrangemnet of Habitat**

Reference: Proceedings of the National Wetland Assessment Symposium, Portland, Maine, June 1985

Author(s) Jeffrey K. Keller

Publisher Jon A. Kusler and Patricia Rieximnger, eds.

Volume number

Issue number

Page(s) 34-37

Multiple Entries? ☐

Date of publication 1985

Assessment method Habitat Evaluation Procedure (HEP)

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **A modification of the Habitat Evaluation Procedure for determining instream flow requirements in warmwater streams**

Reference: North American Journal of Fisheries Management

Author(s) William G. Layher
Kenneth L. Brunson

Publisher

Volume number 12

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Multiple Entries? ☐

Date of publication 1992

Assessment method Habitat Evaluation Procedure (HEP)

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values

Regions of application: Kansas

Wetland types streams

Examples of method application: Used a modified HEP to develop an expedient, defendable procedure for recommending minimum desireable

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **A new method for evaluating wetland functions**

Reference: http://www1.nature.nps.gov/wrd/tnmeval.htm

Author(s) Leslie Krueger

Publisher

Volume number

Issue number

Page(s)

Multiple Entries? ☐

Date of publication 1998

Assessment method Hydrogeomorphic Approach (HGM)

Notes HGM is based on the following principles:
1. Not all wetlands are alike, so it is necessary to classify them by their shared functional properties w/in a geographic region.
2. Functions are a way of expressing, in simple terms, what ecosystems do.
3. Real wetlands (reference wetlands) should be the basis for scaling levels of functioning.

Goals of method

Uses of method To determine which functions will be impacted in evaluating permits for wetland fills under the Clean Water Act.

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application: HGM will be used by the National Park Service for evaluating impacts to wetlands under Executive Order

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **A procedure for assessing wetland functions based on functional classification and reference wetlands**

Reference: http://www.wes.army.mil/el/workshop/FA1-2.html

Author(s) R. Daniel Smith

Publisher US Army Corps of Engineers

Volume number

Issue number

Page(s)

Multiple Entries? ☐

Date of publication

Assessment method Hydrogeomorphic Approach (HGM)

Notes

Goals of method To assess wetland functions in a way that is sensitive to both diversity of wetland types and programmatic constraints of Section 404.

Uses of method To analyze design/location alternatives.
To determine project impacts.
To avoid, minimize, & identify compensatory mitigation.
To monitor compensatory mitigation.

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: riverine, depressional, slope, flat, coastal fringe, & lacustrine fringe

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method: Classification identifies groups of wetlands that function similarly - allows attention to be focused on those functions that a wetland is

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **A Rapid Impact Assessment Method for use in a regulatory context**

Reference: Wetland

Author(s) Eric D. Stein
Richard F. Ambrose

Publisher

Volume number 18

Issue number 3

Page(s) 379-392

Multiple Entries? ☑

Date of publication 1998

Assessment method Cumulative Impacts on Waterbird Habitat

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values plant species alpha diversity (ie., diversity w/in a site)
plant species beta diversity (ie

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **A Rapid Impact Assessment Method for use in a regulatory context**

Reference: Wetland

Author(s) Eric D. Stein
Richard F. Ambrose

Publisher

Volume number 18

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Date of publication 1998

Assessment method Hydrogeomophic Approach (HGM)

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed: hydrologic function
biogeochemical function
habitat function

Indicators of functions/values e.g., topographic complexity, presence of plant debris, plant density, soil features

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **A Rapid Impact Assessment Method for use in a regulatory context**

Reference: Wetland

Author(s) Eric D. Stein
Richard F. Ambrose

Publisher

Volume number 18

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Date of publication 1998

Assessment method Assessment of the Impact of Human Activities on Bottmland Hardwood Ecosystems

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values size
adjacent land use
linear contiguity

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **A Rapid Impact Assessment Method for use in a regulatory context**

Reference: Wetland

Author(s) Eric D. Stein
Richard F. Ambrose

Publisher

Volume number 18

Issue number 3

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Multiple Entries? ☑

Date of publication 1998

Assessment method Biological Evaluation Standardized Technique (BEST)

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values suitability for local target species

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **A Rapid Impact Assessment Method for use in a regulatory context**

Reference: Wetland

Author(s) Eric D. Stein
Richard F. Ambrose

Publisher

Volume number 18

Issue number 3

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Date of publication 1998

Assessment method Index of Biotic Integrity (IBI)

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed: species richness and composition
trophic composition
species abundance

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **A Rapid Impact Assessment Method for use in a regulatory context**

Reference: Wetland

Author(s) Eric D. Stein
Richard F. Ambrose

Publisher

Volume number 18

Issue number 3

Page(s) 379-392

Multiple Entries? ☑

Date of publication 1998

Assessment method Landscape Framework for Assessing Cumulative Impacts to Food Chains

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values patch size and shape
connectivity
spatial relationship

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **A Rapid Impact Assessment Method for use in a regulatory context**

Reference: Wetland

Author(s) Eric D. Stein
Richard F. Ambrose

Publisher

Volume number 18

Issue number 3

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Date of publication 1998

Assessment method Habitat Evaluation System (HES)

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values habitat suitability for a single species

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **A Rapid Impact Assessment Method for use in a regulatory context**

Reference: Wetland

Author(s) Eric D. Stein
Richard F. Ambrose

Publisher

Volume number 18

Issue number 3

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Date of publication 1998

Assessment method Rapid Impact Assessment Method (RIAM)

Notes

Goals of method To provide a framework to assess impacts to aquatic resources while allowing for specialization of evaluation criteria based on habitat type, region of interest, and specific regulatory, palnning, or management goal.

Uses of method To provide a framework to assess impacts to aquatic resources.

Status of use in use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method: scientifically defensible

easy to implement by regulators, planners,

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **A Rapid Impact Assessment Method for use in a regulatory context**

Reference: Wetland

Author(s) Eric D. Stein
Richard F. Ambrose

Publisher

Volume number 18

Issue number 3

Page(s) 379-392

Multiple Entries? ☑

Date of publication 1998

Assessment method Cumulative Impacts to Water Quality

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values changes in nitrogen and phosphorous levels

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **A Rapid Impact Assessment Method for use in a regulatory context**

Reference:	Wetland
Author(s)	Eric D. Stein Richard F. Ambrose
Publisher	
Volume number	18
Issue number	3
Page(s)	379-392
Multiple Entries?	☑
Date of publication	1998
Assessment method	Ecological Assessment of the Coast of Greece
Notes	
Goals of method	
Uses of method	
Status of use	
Regions of testing	
Wetlands types tested	
Results of testing	
Personnel requirements:	
Time requirements:	
Training availability:	
Proposed future revisions:	
Applicable wetland types:	n/a
Functions/values assessed:	
Indicators of functions/values	endangered species species diversity
Regions of application:	
Wetland types	
Examples of method application:	
Strenths of method:	
Limitations of method:	

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **A Rapid Impact Assessment Method for use in a regulatory context**

Reference: Wetland

Author(s) Eric D. Stein
Richard F. Ambrose

Publisher

Volume number 18

Issue number 3

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Multiple Entries? ☑

Date of publication 1998

Assessment method Habitat Evaluation Procedure (HEP)

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values habitat suitability for ecologically important or economically

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **A Rapid Impact Assessment Method for use in a regulatory context**

Reference: Wetland

Author(s) Eric D. Stein
Richard F. Ambrose

Publisher

Volume number 18

Issue number 3

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Date of publication 1998

Assessment method Environmental Evaluation System (EES)

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values physical characteristics of sample site (e.g., size, plant density)

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **A Rapid Impact Assessment Method for use in a regulatory context**

Reference: Wetland

Author(s) Eric D. Stein
Richard F. Ambrose

Publisher

Volume number 18

Issue number 3

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Multiple Entries? ☑

Date of publication 1998

Assessment method EMAP

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values condition indicators (quantitative estimates of ecological resources) - e.g., canopy density, fish

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **A Rapid Impact Assessment Method for use in a regulatory context**

Reference: Wetland

Author(s) Eric D. Stein
Richard F. Ambrose

Publisher

Volume number 18

Issue number 3

Page(s) 379-392

Multiple Entries? ☑

Date of publication 1998

Assessment method Assessment of Restored Coastal Wetlands

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values habitat for endangered species
exclusion of non-native species
% cover

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **A Report on the Development of Indices of Biotic Integrity for Minnesota Wetlands**

Reference: Assessing Wetland Quality with Ecological Indicators (http://www.hort.agri.umn.edu/second/mnwet)

Author(s)
S. Galatowitsch
J. Tester
D. Whited
S. Moe

Publisher

Volume number

Issue number

Page(s)

Multiple Entries? ☐

Date of publication

Assessment method Index of Biotic Integrity (IBI)

Notes Physical and chemical measurements may be inadequate for establishing standards that ensure ecosystem integrity and for detecting cumulative impacts from diverse land uses. Making decisions on how to avoid or minimize degradation to wetlands requires an understanding of how land use affects biological diversity.

Goals of method To enable quality assessments of existing and restored wetlands.

Uses of method

Status of use

Regions of testing Minnesota

Wetlands types tested forest glacial marsh, prairie glacial marsh, wet prairies &

Results of testing Eight series of 15 wetlands (120 sites) were used to develop wetland IBIs.

Each series covers a major wetland type in Minnesota and is comprised of reference sites, sites surrounded by land use typical of the region, and sites that are highly altered.

Plants, birds, fish, invertebrates, and amphibians were surveyed to select the best IBIs for each series.

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: forest glacial marsh, prairie glacial marsh, wet prairies & sedge meadows, non-calcareous littoral wetlands, medium river floodplain wetlands, small river floddplain wetlands, & large river floodplain wetlands

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method: IBI's are specific to the region and wetland type for which they were developed and should not be extrapolated to other areas or kinds of wetlands.

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **A verified Habitat Suitability Index for Louisiana Waterthrush**

Reference: http://www.cas.psu.edu/docs/CASDEPT/FOREST/wetlands/his.htm

Author(s) Diann J. Prosser
R.P. Brooks

Publisher

Volume number

Issue number

Page(s)

Multiple Entries? ☐

Date of publication

Assessment method Habitat Evaluation Procedure (HEP) and Habitat Suitability Index (HSI)

Notes Developed and tested an HSI model for the Louisianna Waterthrush based of US FWS Habitat Evaluation Procedure (HEP) format.

Goals of method

Uses of method

Status of use

Regions of testing central Pennsylvania

Wetlands types tested

Results of testing Based on the model and observation, Louisianna Waterthrush show a strong preference for unpolluted, headwater streams and their associated wetlands occurring in contiguous forest.

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed: Louisianna Waterthrush habitat

Indicators of functions/values coniferous cover
herbaceous cover and height
stream order and microtopography

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Alternate methodologies: The Wisconsin experience in modification of the FHWA's (Adamus) methodology**

Reference: Proceedings of the National Wetland Assessment Symposium, Portland, Maine, June 1985

Author(s) Robert H. Reed

Publisher Jon A. Kusler and Patricia Riexinger (eds.)

Volume number

Issue number

Page(s)

Multiple Entries? ☐

Date of publication 1985

Assessment method Federal Highway Administration's Wetland Functional Assessment

Notes describes problems associated with wetland assessment

determined that FHWA method was a strong method.

WI and MN are developing their own assessment method.

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **An Ecological Assessment of the United States Mid-Atlantic Region: A landscape Atlas**

Reference: http://www.epa.gov/emap/html/pubs/docs/midatl/

Author(s) US EPA

Publisher US EPA

Volume number

Issue number

Page(s)

Multiple Entries? ☐

Date of publication 1998

Assessment method EMAP

Notes

Goals of method

Uses of method

Status of use applied

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values

Regions of application: mid-Atlantic region of US (Delaware, District of Columbia, Maryland, Pennsylania, Virginia, West Virginia)

Wetland types

Examples of method application: Used EMAP to assess relative ecological conditions across mid-Atlantic US.

Strenths of method:

Limitations of method: Compares watersheds based on authors' interpretation of "more" vs. "less" desirable conditions (ie. high degree of forest cover is more

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **An overview of the hierarchical approach being used by the U.S. EPA's Wetland Research Program**

Reference: Wetlands: Biological Assessment Methods and Criteria Development Workshop

Author(s) M.E. Kentula

Publisher US EPA

Volume number

Issue number

Page(s) 29

Multiple Entries? ☐

Date of publication 1996

Assessment method Wetlands Research Program

Notes Provides an overview of the hierarchical approach being used by the U.S. EPA's Wetland Research Program to sample populations of wetlands.

Goals of method This approach provides information on individual wetlands, subgroups w/in the population, and the entire population. Information on the entire population can be used to describe the status of the population in the landscape.

Uses of method To characterize & monitor natural & mitigated wetlands to provide information for management decisions.
To document direct & indirect wetland losses.
To determine the effects of land use changes on wetlands.

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values

Regions of application: Oregon

Wetland types

Examples of method application: 97 sites studied in 4 land-use categories (agriculture, city, residential, undeveloped).

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Analysis of Methodologies Used for Assessment of Wetland Values**

Reference: US Army Corps of Engineers WES technical report

Author(s) Robert I. Lonard
Ellis J. Clairain, Jr.
Robert T. Huffman
J. W. Hardy
Linda D. Brown
Paul E. Ballard
Janet W. Watts

Publisher sponsored by the US Water Resources Council

Volume number

Issue number

Page(s)

Multiple Entries? ☐

Date of publication 1981

Assessment method

Notes ID methods presently used or being developed to assess inland and coastal wetland "functional values"
Preparied criteria and descriptive characteristics for a complete analysis

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Applications of Biological Assessments in Wetlands**

Reference: Wetland Bioassessment Fact Sheet (EPA843-F-98-001)

Author(s) Thomas J. Danielson

Publisher US EPA

Volume number

Issue number

Page(s)

Multiple Entries? ☐

Date of publication 1998

Assessment method bioassessment

Notes

Goals of method

Uses of method
To assess wetland condition.
To diagnose the type of stressor damaging the biota.
To define management approaches to maintain & restore wetland condition.
To evaluate performance of protection and restoration activities.
To develop and support water quality standards.
To certify that permits maintain water quality.
To track water quality condition in wetlands.

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Applying hydrogeomorphic (HGM) concepts to ecological indicator development**

Reference: Wetlands: Biological Assessment Methods and Criteria Development Workshop

Author(s)
R.P. Brooks
D.H. Wardrop
L. Bishel-Machung
T.J. O'Connell
M.T. Gaudette
D.J. Prosser
C.A. Cole

Publisher US EPA

Volume number

Issue number

Page(s) 29

Multiple Entries? ☐

Date of publication 1996

Assessment method Hydrogeomorphic Approach (HGM)

Notes Used a suite of ecological indicators to assess the condition of a set of reference wetlands in PA.

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values

Regions of application: reference wetlands in Pennsylvania

Wetland types depression (isolated, riparian); riverine (headwater floodplain, mainstem floodplain); slope;

Examples of method application: Used a suite of ecological indicators to assess the condition of a set of reference wetlands in PA.

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Applying wetland reference data to functional assessment, mitigation, and restoration**

Reference: Wetlands

Author(s) Richard D. Rheinhardt
Mark M. Brinson
Paul M. Farley

Publisher

Volume number 17

Issue number 2

Page(s) 195-215

Multiple Entries? ☐

Date of publication 1997

Assessment method Hydrogeomorphic Approach (HGM)

Notes

Goals of method

Uses of method

Status of use

Regions of testing southeastern North Carolina

Wetlands types tested mineral soil, wet pine flats

Results of testing Obtained field data from 19 wet flats (reference sites) in southeastern North Carolina

Identified 4 functions performed by mineral soil, wet pine flats.

Showed how HGM can be used:
- to measure ecosystem functions before and after a project site is altered.
- to measure the degree restoration can compensate for a reduction in functions caused by project impact.
- to determine minimum area over which restoration should be applied to achieve no-net-loss in function.

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: mineral soil, wet pine flats

Functions/values assessed: maintain characteristic hydrologic regime
maintain characteristic nutrient and elemental cycling processes

Indicators of functions/values hydrologic regime
- hydrographs from shallow ground-water wells

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Assessing Biological Integrity of Surface Waters**

Reference: Wetland Bioassessment Fact Sheet (EPA843-F-98-001)

Author(s) Thomas J. Danielson

Publisher US EPA

Volume number

Issue number

Page(s)

Multiple Entries? ☐

Date of publication 1998

Assessment method bioassessment

Notes In most cases, the most direct and effective way to assess the biological condition of waterbodies is to:
1. directly measure the condition of their biological communities
2. support those data when necessary by measuring the physical and chemical condition of waterbodies and their watersheds

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method: Biological assessments can detect the effects of the following stressors:
1. toxic levels of metals and other chemicals

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Assessing hydrogeochemical heterogeneity in natual and constructed wetlands**

Reference: Biogeochemistry

Author(s)
R. J. Hunt
D. P. Krabbenhoft
M. P. Anderson

Publisher

Volume number 39

Issue number 3

Page(s) 271-293

Multiple Entries? ☐

Date of publication 1997

Assessment method

Notes The scale at which water quality samples are collected can significantly affect interpretation of biogeochemical processes in wetlands.

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Assessing reconstructed depressional wetlands in the mid-Atlantic states**

Reference: Wetlands: Biological Assessment Methods and Criteria Development Workshop

Author(s) B.M. Teels
D. Sparling

Publisher US EPA

Volume number

Issue number

Page(s) 29

Multiple Entries? ☐

Date of publication 1996

Assessment method Index of Biotic Integrity (IBI) & Index of Biotic Integrity for wetlands

Notes IBI is one of the more commonly used tools for stream ecosystems. The underlying premise of the index is that organisms inhabiting the ecosystem are reliable and measureable indicators of that ecosystem's health.

Goals of method Measures various biological aspects (metrics) of an ecosystem.

Uses of method

Status of use applied (IBI) & in development (wetland IBI)

Regions of testing eastern shore of Delaware & Maryland

Wetlands types tested depressional (reconstructed)

Results of testing Several studies have shown promising results using fish and macroinvertebrate data to calculate IBI scores indicative of stream health.

Wetlands and streams, while sharing some species in common, are sufficiently different to prevent a direct transfer of IBI.

IBI-like index for wetlands is being developed to assess health of mid-Atlantic reconstructed wetlands.
Initial protocols for sampling hydrology, soils, water chemistry, vascular plants, macroinvertebrates, amphibians, birds, & mammals have been developed and will be tested.

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values
- species richness
- proportion of various guilds (e.g., trophic, tolerance, &

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method: Wetlands and streams, while sharing some species in common, are sufficiently different to prevent a direct transfer of IBI.

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Assessing river habitat selection by waterfowl wintering in the south Platte River, Colorado**

Reference: Wetlands

Author(s) Gregory D. Johnson
David P. Young, Jr.
Wallace P. Erickson
M. Dale Strickland
Lyman L. McDonald

Publisher

Volume number 16

Issue number 4

Page(s)

Multiple Entries? ☐

Date of publication 1996

Assessment method Assessing river habitat selection by waterfowl wintering in the south Platte River, Colorado

Notes Assessed river habitat selection of waterfowl wintering in the South Platte River below the Metro Wastewater Reclamation District treatment plant in Adams County, CO to determine potential impacts of proposed river channel modifications.

Goals of method To determine potential impacts of proposed river channel modifications.

Uses of method To determine potential impacts of proposed river channel modifications.

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed: habitat selection of wintering waterfowl

Indicators of functions/values habitat selection of wintering waterfowl:
1. daily mean number of waterfowl

Regions of application: South Platte River, CO

Wetland types riparian

Examples of method application: Due to difference habitat preferences between diving and dabbling ducks, changes that alter river habitat

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Assessing Wetland Functions Using HGM**

Reference: National Wetlands Newsletter

Author(s) Mark Brinson

Publisher Environmental Law Institute

Volume number

Issue number

Page(s) 10-16

Multiple Entries? ☐

Date of publication 1996

Assessment method Hydrogeomorphic approach (HGM)

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Assessing wetland values in landscapes dominated by humanity**

Reference: Proceedings of the National Wetland Assessment Symposium, Portland, Maine, June 1985

Author(s) Mark Brown

Publisher Jon A. Kusler and Patricia Riexinger (eds.)

Volume number

Issue number

Page(s)

Multiple Entries? ☑

Date of publication 1985

Assessment method

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Assessment Model Information for Field Demonstration of the Hydrogeomorphic Approach to Function Assessment of Wetlands (HGM)**

Reference:

Author(s) Richard D. Rheinhardt
Mark M. Brinson

Publisher a conference of unknown title

Volume number

Issue number

Page(s) 7 pp.

Multiple Entries? ☐

Date of publication Sept. 18, 1998

Assessment method Hydrogeomorphic approach (HGM)

Notes for demonstration purposes only

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Assessment of Wetland Functions and Values for the City of Eden Prairie, Minnesota Using an Access-based version of the Minnesota Routine**

Reference:

Author(s) Diane Desotelle
Darlene Dignen
David Kelley
Ron Peterson

Publisher Perterson Environmental Consulting, Inc.

Volume number

Issue number

Page(s) 9 pp.

Multiple Entries? ☐

Date of publication

Assessment method Minnesota Routine Assessment Methodology, version1.0 (MinRAM a.k.a. MnRAM)

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Biological Criteria for Wetlands**

Reference: Wetlands: Biological Assessment Methods and Criteria Development Workshop

Author(s) Susan Jackson

Publisher US EPA

Volume number

Issue number

Page(s) 29

Multiple Entries? ☐

Date of publication 1996

Assessment method Index Biotic Integrity (IBI)

Notes Biocriteria: numerical values or narrative expressions that describe the reference biological conditions of aquatic communities; benchmarks for water resource evaluation & management decision-making

Goals of method

Uses of method

Status of use development & applied

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed: biological integrity

Indicators of functions/values community structure
taxa richness

Regions of application:

Wetland types

Examples of method application:

Strenths of method: Can measure responses to an array of stressors and exposures & show impacts of many currently unmeasured chemical

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Biological integrity: A long-neglected aspect of water resource management**

Reference: Ecological Applications

Author(s) James R. Karr

Publisher

Volume number 1

Issue number 1

Page(s) 66-84

Multiple Entries? ☑

Date of publication 1991

Assessment method Rapid Bioassessment Protocol III (RBP)

Notes

Goals of method To assess the biotic integrity of benthic invertebrate communities.

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values taxon richness
family biotic index
ratio of scraper/filtering collector

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Biological integrity: A long-neglected aspect of water resource management**

Reference: Ecological Applications

Author(s) James R. Karr

Publisher

Volume number 1

Issue number 1

Page(s) 66-84

Multiple Entries? ☑

Date of publication 1991

Assessment method Invertebrate Community index (ICI)

Notes

Goals of method To assess the biological integrity of benthic invertebrate communities.

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values total # of taxa
# of mayfly taxa
# of caddisfly taxa

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Biological integrity: A long-neglected aspect of water resource management**

Reference: Ecological Applications

Author(s) James R. Karr

Publisher

Volume number 1

Issue number 1

Page(s) 66-84

Multiple Entries? ☑

Date of publication 1991

Assessment method Index of Biotic Integrity (IBI)

Notes

Goals of method To assess the biotic integrity of running waters

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed: species richness and composition
trophic composition
fish abundance and composition

Indicators of functions/values species richness and composition
- total number of native fish species

Regions of application: An IBI based on fish community attributes has been widely applied in North America.

Wetland types

Examples of method application:

Strenths of method: IBI can be modified to incorporate other aspects of the fish community:
ie., species composition within major taxa,

Limitations of method: Adaptation of IBI to geographic regions outside the midwestern US requires modification, deletion, or replacement of selected IBI metrics,

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Birds as bioindicators of wetland condition: Indices, reference sites, and monitoring**

Reference: Wetlands: Biological Assessment Methods and Criteria Development Workshop

Author(s) P.R. Adamus

Publisher US EPA

Volume number

Issue number

Page(s) 29

Multiple Entries? ☐

Date of publication 1996

Assessment method Avian Richness Evaluation Method (AREM)

Notes

Goals of method

Uses of method

Status of use proposed

Regions of testing

Wetlands types tested

Results of testing Birds can complement plants, aquatic invertebrates, & other organisms as bioindicators of wetland quality, particularly at a landscape scale.

Wetlands selected as reference sites for mitigation & permitting could, under some conditions, be used in the development & application of biocriteria and HGM reference standards that reflect avian habitat needs.

Personnel requirements: Requires repeated visits by skilled observers.

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method: Birds are useful indicators bcause they are :
relatively easy to sample
spatially & temporally integrative

Limitations of method: Problems with using birds as indicators are that:
their presence alone is not conslusive
it is difficult to link birds with stressors

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Building a new approach to the investigation and assessment of wetland ecosystem functioning**

Reference: Global Wetlands: Old World and New

Author(s)
E. Maltby
D. V. Hogan
C. P. Immirzi
J. H. Tellam
M. J. van der Peijl

Publisher Elsevier Science B. V.

Volume number

Issue number

Page(s) 637-658

Multiple Entries? ☐

Date of publication 1994

Assessment method

Notes describes interdisciplinary and international research being undertaken to solve some of the problems of wetland conservation

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Can we apply concepts from the development of biological criteria in Ohio streams and rivers to wetlands?**

Reference: Wetlands: Biological Assessment Methods and Criteria Development Workshop

Author(s) C.O. Yoder
S. Fennessy

Publisher US EPA

Volume number

Issue number

Page(s) 29

Multiple Entries? ☑

Date of publication 1996

Assessment method Floristic Quality Assessment Index (FQAI)

Notes comparable to a Hilsenhoff biotic index

Goals of method

Uses of method

Status of use development & applied

Regions of testing Ohio

Wetlands types tested

Results of testing Being tested along with macroinvertebrate & amphibian biocriteria for Ohio EPA.

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed: vegetative biological integrity

Indicators of functions/values species richness
tolerance values for flora

Regions of application: Ohio

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Can we apply concepts from the development of biological criteria in Ohio streams and rivers to wetlands?**

Reference: Wetlands: Biological Assessment Methods and Criteria Development Workshop

Author(s) C.O. Yoder
S. Fennessy

Publisher US EPA

Volume number

Issue number

Page(s) 29

Multiple Entries? ☑

Date of publication 1996

Assessment method bioassessment

Notes Biocriteria are based on measureable characteristics of fish & macroinvertebrate assemblages & are used to assess the biological integrity of surface waters.
Biocriteria function primarily as an ambient assessment tool and are the pricipal arbiter of aquatic life use attainment or non-attainment for Ohio's rivers and streams.

Goals of method

Uses of method To define the attainable condition for a class of wetlands in a given region. To develop a wetland classification system in which the highest attaining class will be protected to the fullest extent, while restoration or enhancement goals are set for more impaired systems.

Status of use development & applied

Regions of testing Ohio

Wetlands types tested

Results of testing Potentially ecologically meaningful indicators are being tested to determine if they possess the sensitivity needed to discriminate between least-impacted & impaired wetlands.

Methodologies to assess vegetation, macroinvertebrate, & amphibian communities are under development & will be standardized to ensure that they are relatively rapid, repeatable, & transferable to others conducting biological monitoring.

Biologic integrity will be operationaly defined, based on least-impacted reference sites. Reference sites have been selected based on hydrogeomorphic setting, degree of impact, & proximity to active Ohio EPA stream reference sites.

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values

Regions of application: Ohio

Wetland types

Title **Can we apply concepts from the development of biological criteria in Ohio streams and rivers to wetlands?**

Examples of method application: Ohio EPA incorporated biocriteria into the Ohio Water Quality Standards (WQS) regulations in Feb.

Strenths of method: Biocriteria provide the impetus & opportunity to recognize & account for natural ecological variability in the environment. One important

Limitations of method:

- [ ] Can directly compare wetlands within the same class?
- [ ] Can directly compare wetlands from different classes?
- [ ] Can be used as a guide for design?

Reference: Wetlands

Author(s) Mark M. Brinson

Publisher Society of Wetland Scientists

Volume number 13

Issue number 2

Page(s) 65-74

Multiple Entries? [ ]

Date of publication 1993

Assessment method

Notes landscape-based vs. resource-based transitions in functioning

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

- [ ] Can directly compare wetlands within the same class?
- [ ] Can directly compare wetlands from different classes?
- [ ] Can be used as a guide for design?

Title **Characterization of wetland hydrology using hydrogeomorphic classification**

Reference: Wetlands

Author(s) Paul W. Shaffer
Mary E. Kentula
Stephanie E. Gwin

Publisher

Volume number 19

Issue number 3

Page(s) 490-504

Multiple Entries? ☐

Date of publication 1999

Assessment method Hydrogeomorphic Approach (HGM)

Notes

Goals of method

Uses of method

Status of use

Regions of testing Portland, Oregon vicinity

Wetlands types tested slope, riverine, depression, depression-in-riverine

Results of testing Monitored water levels in 45 wetlands for 3 years to characterize their hydrology and classify them by HGM class to determine whether hydrologic regimes differ in wetlands in different HGM classes.

Results highlight the importance of both geomorphic setting and wetland structure in defining wetland hydrology and support the use of HGM for wetland classification.

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: slope, riverine, depression, depression-in-riverine setting, depression-in-slope setting, & in-stream-depression

Functions/values assessed: hydrology

Indicators of functions/values - biweekly recording of water levels using a staff gauge and shallow well
- predominant local land use

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Comparisons and contrasts between functional assessment and other bioassessment approaches**

Reference: Wetlands: Biological Assessment Methods and Criteria Development Workshop

Author(s) M.M. Brinson
E.J. Clairain, Jr.
L.C. Lee
D. Smith

Publisher US EPA

Volume number

Issue number

Page(s) 29

Multiple Entries? ☑

Date of publication 1996

Assessment method Index Biotic Integrity (IBI)

Notes

Goals of method Focuses on the composition of biological communities as a measure of biotic integrity.

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method: reference-based

Limitations of method: Relies little on the physical characteristics of the ecosystem (water flows, soil, nutrients), but rather more on the response of the biotic community to

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title Comparisons and contrasts between functional assessment and other bioassessment approaches

Reference: Wetlands: Biological Assessment Methods and Criteria Development Workshop

Author(s) M.M. Brinson
E.J. Clairain, Jr.
L.C. Lee
D. Smith

Publisher US EPA

Volume number

Issue number

Page(s) 29

Multiple Entries? ☑

Date of publication 1996

Assessment method Hydrogeomorphic Approach (HGM)

Notes

Goals of method

Uses of method To provide standards to design & evaluate restoration projects

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method: Classifies wetlands by geomorphic setting, water resources, and hydrodynamics for the purpose of controlling natural variation.

Limitations of method: requires consensus on the least-altered condition

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Compendium of Tools for Watershed Assessment and TMDL Development**

Reference: n/a

Author(s) L. Shoemaker
M. Lahlou
M. Bryer
D. Kumar
K. Kratt

Publisher US EPA

Volume number

Issue number

Page(s) 117

Multiple Entries? ☑

Date of publication May 1997

Assessment method Hydrogeomorphic Approach (HGM)

Notes

Goals of method A Hydrogeomorphic classification & assessment methodology for determining the integrity of physical, chemical, & biological functions of wetlands as they compare to reference conditions.

Uses of method To assess the degree to which a wetland performs expected physical, chemical, and biological functions.

Status of use in development

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Compendium of Tools for Watershed Assessment and TMDL Development**

Reference: n/a

Author(s)
L. Shoemaker
M. Lahlou
M. Bryer
D. Kumar
K. Kratt

Publisher US EPA

Volume number

Issue number

Page(s) 117

Multiple Entries? ☑

Date of publication May 1997

Assessment method Minnesota Stream Temperature Model (MNSTREAM)

Notes

Goals of method A computer model that simulates dynamic stream temperatures averaged over 1-6 hours.

Uses of method To simulate dynamic water temperatures for a stream

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements: requires substantial input data

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values

Regions of application: US EPA Monticello Experimental Streams, numerous streams in the upper Midwest central Platte River

Wetland types

Examples of method application: Used to predict hourly temps. in the US EPA Monticello Experimental Streams, numerous streams in the

Strenths of method:

Limitations of method: MNSTREAM has been developed for maximum accuracy with minimum calibration, and therefore requires substantial input data.

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Compendium of Tools for Watershed Assessment and TMDL Development**

Reference: n/a

Author(s) L. Shoemaker
M. Lahlou
M. Bryer
D. Kumar
K. Kratt

Publisher US EPA

Volume number

Issue number

Page(s) 117

Multiple Entries? ☑

Date of publication May 1997

Assessment method Population Viability Analyses (PVA)

Notes

Goals of method Population dynamics modeling for aquatic or terrestrial populations that examines how expected time to extinction changes with the effects of demographic, genetic, or environmental variability on population stability,

Uses of method To provide simulations of the impact of a stressor to examine how expected time to extinction changes with the environment, population structure, or behavior.

Status of use applied

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values age structure of population
survival & fecundity of each age or life stage

Regions of application:

Wetland types

Examples of method application: Used extensively for ecological risk analysis and wildlife population research.

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Compendium of Tools for Watershed Assessment and TMDL Development**

Reference: n/a

Author(s)
L. Shoemaker
M. Lahlou
M. Bryer
D. Kumar
K. Kratt

Publisher US EPA

Volume number

Issue number

Page(s) 117

Multiple Entries? ☑

Date of publication May 1997

Assessment method Rapid Bioassessment Protocols (RBPs)

Notes

Goals of method A set of 5 protocols that offer techniques of varying complexity to characterize the biological integrity of streams and rivers.

Uses of method To determine whether biological impairments exist in a stream or river.
To provide information on ranking sites and prioritization for further assessment.
To establish a basis for trend monitoring.

Status of use applied

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application: Used successfully in a variety of watershed management applications.

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Compendium of Tools for Watershed Assessment and TMDL Development**

Reference: n/a

Author(s)
L. Shoemaker
M. Lahlou
M. Bryer
D. Kumar
K. Kratt

Publisher US EPA

Volume number

Issue number

Page(s) 117

Multiple Entries? ☑

Date of publication May 1997

Assessment method Rosgen's Stream Classification

Notes

Goals of method Classification method that uses morphological stream characteristics to organize streams into relatively homogenous stream types.

Uses of method To evaluate sensitivity to disturbance & predict stream behavior from watershed changes.
To assess stream morphology impacts.
To design stable, self-maintaining channels in restoration.
To determine flow resistance.
To select appropriate fish habitat improvements.

Status of use applied

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application: applied successfully to various streams throughout the US

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Compendium of Tools for Watershed Assessment and TMDL Development**

Reference: n/a

Author(s) L. Shoemaker
M. Lahlou
M. Bryer
D. Kumar
K. Kratt

Publisher US EPA

Volume number

Issue number

Page(s) 117

Multiple Entries? ☑

Date of publication May 1997

Assessment method Visual-based Habitat Assessments

Notes

Goals of method To characterize integrity of aquatic habitats.

Uses of method To determine whether impairments exist.
To prioritize streams for more detailed assessment.

Status of use applied

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application: used by watershed managers throughout the US

Strenths of method: quick & cost-effective

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Compendium of Tools for Watershed Assessment and TMDL Development**

Reference: n/a

Author(s) L. Shoemaker
M. Lahlou
M. Bryer
D. Kumar
K. Kratt

Publisher US EPA

Volume number

Issue number

Page(s) 117

Multiple Entries? ☑

Date of publication May 1997

Assessment method Stream Network Segment Temperature Models (SNTEMP)

Notes

Goals of method Computer models that simulate mean daily water temperature for a stream network with multiple tributaries for multiple time periods.

Uses of method To decide whether regulatory requirements are being met for fisheries in rivers and streams.

Status of use applied

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed: stream geometry
hydrology
meteorology

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application: Used extensively by the US Fish and Wildlife Service and state fisheries management agencies.

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Compendium of Tools for Watershed Assessment and TMDL Development**

Reference: n/a

Author(s)
L. Shoemaker
M. Lahlou
M. Bryer
D. Kumar
K. Kratt

Publisher US EPA

Volume number

Issue number

Page(s) 117

Multiple Entries? ☑

Date of publication May 1997

Assessment method Habitat Evaluation System (HES)

Notes

Goals of method Community-based evaluation technique used to assess impacts of development for 2 aquatic habitats and 5 terrestrial habitats.

Uses of method To evaluate effects of projects on the quantity and quality of wildlife habitats in the Lower Mississippi Valley Region of the US.
To aid in selection between project alternatives.

Status of use applied

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: streams, lakes, wooded swamps, upland forests, bottomland hardwood forests, & open lands

Functions/values assessed: terrestrial wildlife value of aquatic habitats

Indicators of functions/values baseline data on habitat types & land use

Regions of application: Lower Mississippi Valley Region

Wetland types

Examples of method application: HES has been used in major ecosystems in the Lower Mississippi Valley Region.

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Compendium of Tools for Watershed Assessment and TMDL Development**

Reference: n/a

Author(s)
L. Shoemaker
M. Lahlou
M. Bryer
D. Kumar
K. Kratt

Publisher US EPA

Volume number

Issue number

Page(s) 117

Multiple Entries? ☑

Date of publication May 1997

Assessment method Invertebrate Community Index (ICI)

Notes

Goals of method Biological index usually used with IBI to provide a measure of the integrity of aquatic invertebrate communities.

Uses of method To determine whether a waterbody is impaired.
To provide information for ranking sites and prioritization for further assessment.
To establish a basis for trend monitoring.

Status of use applied

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values total # of taxa
# of mayfly taxa
# of caddisfly taxa

Regions of application: Ohio

Wetland types

Examples of method application: Used extensively for assigning causes of and sources to aquatic life use impairments in Ohio stream and

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Compendium of Tools for Watershed Assessment and TMDL Development**

Reference: n/a

Author(s) L. Shoemaker
M. Lahlou
M. Bryer
D. Kumar
K. Kratt

Publisher US EPA

Volume number

Issue number

Page(s) 117

Multiple Entries? ☑

Date of publication May 1997

Assessment method Wetland Evaluation Technnique, version 2.0 (WET II)

Notes

Goals of method Community-based habitat evaluation approach that can provide a broad overview of potential project impacts on several wetland habtat functions.

Uses of method To conduct initial, rapid evaluate wetland functions & values.
To prioritize wetlands for more detailed, site-specific research.
To determine effects of pre-project and post-project activities on wetland functions and values.

Status of use applied

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed: groundwater discharge
groundwater recharge
sediment stabilization

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application: used extensively by the US Army Corps of Engineers & other agencies to evaluate many of their water

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Compendium of Tools for Watershed Assessment and TMDL Development**

Reference: n/a

Author(s) L. Shoemaker
M. Lahlou
M. Bryer
D. Kumar
K. Kratt

Publisher US EPA

Volume number

Issue number

Page(s) 117

Multiple Entries? ☑

Date of publication May 1997

Assessment method Habitat Evaluation Procedure (HEP)

Notes

Goals of method Species-based evaluation that determines the quality & quantity of available habitat for selected aquatic & terrestrial wildlife species, and measures the impact of proposed or anticipated land or water use changes on that habtat.

Uses of method Quantitative assessment of habitat conditions for wildlife species.
Comparison of the impacts of project alternatives on wildlife resources.

Status of use applied

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values delineation of cover types w/in project area
acreage of existing habitat for each

Regions of application:

Wetland types

Examples of method application: Used extensively by the US Fish and Wildlife Service, US Army Corps of Engineers, and the US Bureau of

Strenths of method: Additional software (Habitat Management Evaluation Method System) allows users to investigate and compare cost-effectiveness of

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Compendium of Tools for Watershed Assessment and TMDL Development**

Reference: n/a

Author(s) L. Shoemaker
M. Lahlou
M. Bryer
D. Kumar
K. Kratt

Publisher US EPA

Volume number

Issue number

Page(s) 117

Multiple Entries? ☑

Date of publication May 1997

Assessment method Food and Gill Exchange of Toxic Substances (FGETS)

Notes

Goals of method To model fish bioaccumulation for laboratory conditions or field assessments.
Provides an objective, process-based assessment of residue-based, toxicology responses and dietary exposures for fish assemblages.

Uses of method Provides regulators and practitioners with an objective, process-based assessment of residue-based, toxicology responses and dietary exposures for fish assemblages.

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application: Used extensively for ecotoxicology studies.

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Compendium of Tools for Watershed Assessment and TMDL Development**

Reference: n/a

Author(s)
L. Shoemaker
M. Lahlou
M. Bryer
D. Kumar
K. Kratt

Publisher US EPA

Volume number

Issue number

Page(s) 117

Multiple Entries? ☑

Date of publication May 1997

Assessment method Instream Flow Incremental Methodology (IFIM)

Notes

Goals of method Conceptual framework that consists of a collection of analytical procedures and computer models used to assess riverine habitats.

Uses of method Can be applied as guidelines to solve problems regarding the hydraulic disturbance of riverine ecosystems.

Status of use applied

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values physical characteristics (e.g., depth, velocity, stream channel characteristics

Regions of application: Used extensively by the US Fish and Wildlife Service and state fisheries management agencies

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Compendium of Tools for Watershed Assessment and TMDL Development**

Reference: n/a

Author(s) L. Shoemaker
M. Lahlou
M. Bryer
D. Kumar
K. Kratt

Publisher US EPA

Volume number

Issue number

Page(s) 117

Multiple Entries? ☑

Date of publication May 1997

Assessment method Index of Well-Being (IWB)

Notes

Goals of method Biological index usually used with IBI to provide a measure of the integrity of fish communities.

Uses of method To determine whether a waterbody is impaired.
To provide information for ranking sites and prioritization for further assessment.
To establish a basis for trend monitoring.

Status of use applied

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed: # of individuals/kilometer
biomass of individuals/kilometer
Shannon-Weaver diversity index (# of

Indicators of functions/values

Regions of application: Ohio

Wetland types

Examples of method application: Used extensively for assigning causes of and sources to aquatic life use impairments in Ohio stream and

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Compendium of Tools for Watershed Assessment and TMDL Development**

Reference: n/a

Author(s)
L. Shoemaker
M. Lahlou
M. Bryer
D. Kumar
K. Kratt

Publisher US EPA

Volume number

Issue number

Page(s) 117

Multiple Entries? ☑

Date of publication May 1997

Assessment method Stream Segment Temperature Models (SSTEMP)

Notes

Goals of method Computer models that simulate mean daily water temperature for a stream segment for a single time period.

Uses of method To decide whether regulatory requirements are being met for fisheries in rivers and streams.

Status of use applied

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:
stream geometry
hydrology
meteorology

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application: Used extensively by the US Fish and Wildlife Service and state fisheries management agencies.

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Conclusions, Recommendations, and Research Needs**

Reference: Proceedings of the National Wetland Assessment Symposium, Portland, Maine, June 1985

Author(s) Jon A. Kusler

Publisher Jon A. Kusler and Patricia Riexinger (eds.)

Volume number

Issue number

Page(s)

Multiple Entries? ☑

Date of publication 1985

Assessment method

Notes Discusses priorities for future research:
1. Water quality functions
7. Assessment of regional wetland functions
2. Hydrology
8. Buffers
3. Evaluation of altered systems & wetland restoration techniques
9. Cumulative impact assessment
4. Effectiveness of mitigation approaches
5. Natural cycles and wetland succession
6. Rating and ranking

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Consideration of spatial & temporal scales in development of multi-metric indicators for wetlands: Examples from the Prairie Pothole Region**

Reference: Wetlands: Biological Assessment Methods and Criteria Development Workshop

Author(s) N. Detenback

Publisher US EPA

Volume number

Issue number

Page(s) 29

Multiple Entries? ☐

Date of publication 1996

Assessment method bioassessment

Notes Standardization of indicator measurements for streams has focused on maximinzing the signal:noise ratio. However, spatial and temporal variation are integral characterisitcs of wetland ecotones, & biota have evolved life cycles and responses to specific scales of variability. Stratification, window selection, & smoothing techniques for wetland indicator development must be chosen so as to maximize ecological information as well as to minimize background noise. In some cases, measurement of variance (min/max, heterogeneity) may be more ecologically significant than measurement of system averages.

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Corps of Engineers Perspective of Wetland Assessment**

Reference: Proceedings of the National Wetland Assessment Symposium, Portland, Maine, June 1985

Author(s) Lieutenant Colonel Ronald Kelsey

Publisher Jon A. Kusler and Patricia Riexinger (eds.)

Volume number

Issue number

Page(s)

Multiple Entries? ☑

Date of publication 1985

Assessment method

Notes Identifies several generic problems with wetland assessment procedures:
1. Lack of standard, objectively-applied procedures that considers all known wetland functions -> leads to different conclusions based on different assessors
2. Lack of documentation and/or attention on some fucntions while others (ie. fish & wildlife habitat) are well-documented
3. Lack and unavailability of pertinent technical literature for wetland assessment
4. Differences in attitudes among different agencies

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Corps of Engineers Perspective of Wetland Assessment**

Reference: Proceedings of the National Wetland Assessment Symposium

Author(s) Ronald Kelsey

Publisher

Volume number

Issue number

Page(s)

Multiple Entries? ☑

Date of publication 1985

Assessment method Habitat Evaluation Procedure (HEP)

Notes

Goals of method To assess wetland functions associated with fish and wildlife resources.

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed: special study areas (sanctuaries, refuges, etc)
protection fo areas from storm action
flood storage

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

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Reference: Proceedings of the National Wetland Assessment Symposium

Author(s) Ronald Kelsey

Publisher

Volume number

Issue number

Page(s)

Multiple Entries? ☑

Date of publication 1985

Assessment method Habitat Evaluation System (HES)

Notes

Goals of method To assess wetland functions associated with fish and wildlife resources.

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed: special study areas (sanctuaries, refuges, etc)
protection fo areas from storm action
flood storage

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Cumulative impacts of Section 404 Clean Water Act permitting on the riparian habitat of the Santa Margarita, CA watershed**

Reference: Wetlands

Author(s) Eric D. Stein
Richard F. Ambrose

Publisher

Volume number 18

Issue number 3

Page(s) 393-408

Multiple Entries? ☐

Date of publication 1998

Assessment method Rapid Impact Assessment Method (RIAM)

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed: endangered species habitat
structural diversity
spatial diversity

Indicators of functions/values

Regions of application: Santa Margarita, CA

Wetland types

Examples of method application: Used RIAM to assess cumulative impacts of rapid development in the upper watershed.

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Cumulative impacts of Section 404 Clean Water Act permitting on the riparian habitat of the Santa Margarita, California watershed**

Reference: Wetlands

Author(s) Eric D. Stein
Richard F. Ambrose

Publisher

Volume number 18

Issue number 3

Page(s) 393-408

Multiple Entries? ☐

Date of publication 1998

Assessment method Rapid Impact Assessment Method (RIAM)

Notes The Santa Margarita River is one of the few remaining free-flowing river systems on southern CA coastal plain and one of the most expansive, unspoiled riparian habitats is southern CA.

There was concern that impacts of rapid development in the upper watershed will degrade the entire watershed.

Goals of method To assess impacts of development.

Uses of method To assess impacts of development.

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed: endangered species habitat
structural diversity
spatial diversity

Indicators of functions/values

Regions of application: Santa Margarita River, CA

Wetland types

Examples of method application: Used to assess impacts of development on Margarita River watershed.

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Decision sequence for functional wetlands restoration**

Reference: Water, Air, & Soil Pollution

Author(s) M. M. Davis

Publisher

Volume number 77

Issue number 3-4

Page(s) 497-511

Multiple Entries? ☐

Date of publication 1994

Assessment method

Notes Provides a model for decision making to ensure that wetland restoration projects achieve functional replacement.

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Design and implementation of functional wetland mitigation - Case studies in Ohio and South Carolina**

Reference: Water, Air, & Soil Pollution

Author(s) S. A. McCuskey
A. W. Conger
H. O. Hillestad

Publisher

Volume number 77

Issue number 3-4

Page(s) 513-532

Multiple Entries? ☐

Date of publication 1994

Assessment method

Notes wetland design

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Developing an approach for assessing the functions of wetlands**

Reference: Global Wetlands: Old World and New (ed. W.J. Mitsch)

Author(s)
M.M. Brinson
W. Kruczynski
L.C. Lee
W.L. Nutter
R.D. Smith
D.F. Whigham

Publisher Elsevier Science B.V.

Volume number

Issue number

Page(s)

Multiple Entries? ☐

Date of publication 1994

Assessment method Hydrogeomorphic Approach (HGM)

Notes Presents a 5-step proposal for developing an approach to assess wetlan ecosystems:
1. Classify wetlands based on hydrogeomorphic (HGM) properties.
2. Define the relationship between HGM properties and functions (represents scientific basis for the presence of the function)
3. Develop functional profiles for each wetland class.
4. Develop a scale for expressing functions by using indicators and profiles from reference wetlands.
5. Develop the assessment methodology itself.
Focuses on philosophy and rationale for assessment rather than mechanics themselves.

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

- [ ] Can directly compare wetlands from different classes?
- [ ] Can be used as a guide for design?

Title **Developing bioassessment protocols for Montana wetlands**

Reference: Wetlands: Biological Assessment Methods and Criteria Development Workshop

Author(s)
R. Apfelbeck
L. Bahls
M. Shapley
J. Gerritsen
M. Barbour
J. Stribling
D. Charles
F. Acker

Publisher US EPA

Volume number

Issue number

Page(s) 29

Multiple Entries? ☐

Date of publication 1996

Assessment method bioassessment

Notes

Goals of method

Uses of method

Status of use in development

Regions of testing Montana

Wetlands types tested

Results of testing

80 wetlands sampled to develop wetland bioassessment protocols.

Multi-metric approach was used to develop a macroinvertebrate index to assess wetland water quality. # of taxa & % dominance metrics were the most responsive to stressors.

Preliminary results indicate detection of impairments caused by metals, nutrients, salinity, sediment, & fluctuating water levels.
The ability to detect water quality impairment w/the macroinvertebrate index decreased for wetlands that were ephemeral, at high elevations, or where water column was alkaline or saline.
Factors that correlated most closely w/diatom assemblage composition were conductivity, pH, & total phosphorous.

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values
water column chemistry
sediment chemistry

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Development of a stream habitat index for use with an Index of Biotic Integrity in the St. Croix River Basin, Minnesota**

Reference: U.S. Geological Survey Water-Resources Investigations Report 99-4290

Author(s) R.M. Goldstein
D.L. Lorenz
Scott Niemela

Publisher

Volume number

Issue number

Page(s)

Multiple Entries? ☐

Date of publication 2000

Assessment method Index of Biotic Integrity (IBI)

Notes Developed a habitat index for use to evaluate water quality and the effects of nonpoint-source effects not associated with habitat degradation. The index is based on the sum of pluses or minus dependent on the variable's correlation to iotic integrity.

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed: hydrology (basin-level variables)
geomorphology (reach-level variables)
instream habitat

Indicators of functions/values hydrology (basin-level variables)
- size of drainage basin in

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Development of an Invertebrate Community Index (ICI) for wetlands**

Reference: http://www.cas.psu.edu/docs/CASDEPT/FOREST/wetlands/bugs.htm

Author(s) Robin J. Bennett
R.P. Brooks

Publisher

Volume number

Issue number

Page(s)

Multiple Entries? ☐

Date of publication

Assessment method Invertebrate Community Index (ICI)

Notes

Goals of method

Uses of method

Status of use in development

Regions of testing central PA

Wetlands types tested

Results of testing Examined the potential of using aquatic macroinvertebrates as biological indicators if wetland condition in order to develop a wetland invertebrate community index (W-ICI).

Classified sites using HGM calssification.

Will examine a variety of invertebrate community attributes (esp. in relation to taxonomy, trophic status, and habitat preferences) against a range of human perturbations (from land-use patterns to habitat fragmentation) to look for correlations that suggest response by macroinvertebrates in order to find the best metrics and form the W-ICI.

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed: biological integrity

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Development of evironmental performance measures for Florida's lower east coast water supply plan**

Reference: Wetlands: Biological Assessment Methods and Criteria Development Workshop

Author(s) D.R. Swift
C.J. Neidrauer
N.C. Krishnan

Publisher US EPA

Volume number

Issue number

Page(s) 29

Multiple Entries? ☐

Date of publication 1996

Assessment method South Florida Water Management Model (SFWMM)

Notes

Goals of method Simultates current & future surface and ground water condition within the study area as a method to evaluate proposed water supply alternatives.

Uses of method to guide public policy as it realtes to protecting & enhancing water resources of South Florida

Status of use in development & applied

Regions of testing Lake Okeechobee, FL
St. Lucie River estuary, FL

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values 1. hydroperiod & surface water ponding difference maps

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Development of the Hydrogeomorphic Approach to functional assessment of wetlands, with emphasis on the riverine class**

Reference:

Author(s) Marian E. Norris

Publisher

Volume number

Issue number

Page(s)

Multiple Entries? ☐

Date of publication

Assessment method Hydrogeomorphic Approach (HGM)

Notes

Goals of method To assess wetlands based on functions in order to make regulatory, planning, and other management decisions.

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: riverine, depressional, slope, estuarine fringe, lacustrine fringe, mineral soil flats, & organic soil flats

Functions/values assessed: hydrology
biogeochemistry
plant habitat

Indicators of functions/values hydrology:
dynamic surface water storage
long-term surface water storage

Regions of application:

Wetland types

Examples of method application:

Strenths of method: Classifies wetlands based on functional differences.
Articulates functions in a way that is not

Limitations of method: Does not assess offsite impacts or cummulative impacts on a landscape scale, assign value, or compare across regional subclasses.

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Diatoms as indicators in the Environmental Monitoring and Assessment Program - Surface Waters (EMAP-SW)**

Reference: Environmental Monitoring and Assessment

Author(s) Sushil S. Dixit
John P. Smol

Publisher

Volume number 31

Issue number

Page(s) 275-306

Multiple Entries? ☐

Date of publication 1994

Assessment method EMAP

Notes Article deals with EMAP-SW (surface waters) rather than EMAP-W (wetlands).

Goals of method To evaluate biotic integrity, trophic condition, and fishability of lakes and streams.

Uses of method

Status of use testing

Regions of testing northeastern US
(New York, New Jersey, Connecticut, Rhode Island,

Wetlands types tested lakes

Results of testing Sedimentary diatom assemblages were studied from 66 lakes in northeastern US to evaluate the applicability of diatoms for EMAP-SW.

Showed that diatoms are an effective means to answer a diverse set of environmental questions.

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: lakes & streams

Functions/values assessed: biotic integrity
trophic condition
fishability

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Does intertidal vegetation indicate specific soil and hydrologic conditions**

Reference: Wetlands

Author(s)
C. T. Hackney
S. Brady
L. Stemmy
M. Boris
C. Dennis
T. Hancock
M. Obryon
C. Tilton
E. Barbee

Publisher

Volume number 16

Issue number 1

Page(s) 89-94

Multiple Entries? ☐

Date of publication 1996

Assessment method

Notes yes for 4 of 6 zones

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Ecological assessment for the wetlands at Milltown Reservoir, Missoula, Montana: Characterization of emergent and upland habitats**

Reference: Environmental Toxicology and Chemistry

Author(s)
Greg Linder
Robert Hazelwood
Don Palawski
Michael Bollman
David Wilborn
John Malloy
Kristi DuBois
Suean Ott
Gary Pascoe
Julie DalSoglio

Publisher

Volume number 13

Issue number 12

Page(s) 1957-1970

Multiple Entries? ☐

Date of publication 1994

Assessment method

Notes ecological risk assessment with various types of tests showed that biological and ecological effects were subtle in their expression within the reservoir

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **EMAP shifts focus to research**

Reference: Environmental Science & Technology

Author(s) Alan Newman

Publisher

Volume number 29

Issue number 3

Page(s) 113A

Multiple Entries? ☐

Date of publication 1995

Assessment method EMAP

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method: Scope of EMAP was scaled back due to concerns about its scientific underpinnings, and it does not have sufficient funds to allow monitoring at the

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **EMAP-wetlands: a program for assessing wetland condition**

Reference: Global Wetlands: Old World and New

Author(s) R.P. Novitzki

Publisher Elsevier Science

Volume number

Issue number

Page(s)

Multiple Entries? ☐

Date of publication 1994

Assessment method EMAP

Notes

Goals of method Quantitative assesment of current status and long-term trends in selected indicators of condition of wetland resources at regional and national scales.

Uses of method

Status of use in development

Regions of testing Louisiana
prairie pothole region from North Dakota to Iowa

Wetlands types tested estaurine emergents
(Louisiana)

Results of testing Gulf Coast Salt Marsh Pilot Study (Louisiana):
- study to develop indicators for estuaine emergents
- results not yet completed at time of article

Midwest Prairie Wetland Pilot Study:
- study to test & evaluate indicators of ecological condition of palustrine emergents in prairie pothole region.
- results not yet completed at time of article

Bottomland Hardwood Wetland Pilot Study (Southeast):
- only in planning stages at time of article

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: 5 systems [based on broad hydrogeologic classes], 8 subsystems, & 56 classes
priority classes [developed first]: estuarine emergents, palustrine emergents, & palustrine forested wetlands

Functions/values assessed: biological integrity
- plant diversity (commuity composition)
- animal diversity (community composition)

Indicators of functions/values 1. biological integrity:
plant diversity (commuity
composition), # of native, rare

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **EMAP-Wetlands: A sampling design with global application**

Reference: Vegetatio

Author(s) R.P. Novitzki

Publisher

Volume number 118

Issue number

Page(s) 171-184

Multiple Entries? ☐

Date of publication 1995

Assessment method EMAP

Notes EMAP initiated in 1988.

Goals of method To provide quantitative assessments of the current status and long-term trends in the ecological condition of wetland resources.

Uses of method

Status of use in development

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method: Ulitmately assessments of individual resources will be combined into landscape-level assessments of ecological resources.

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Environmental gradients and identification of wetlands in north-central Florida**

Reference: Wetlands

Author(s) M. M. Davis
S. W. Sprecher
J. S.Wakeley
G. R. Best

Publisher

Volume number 16

Issue number 4

Page(s) 512-523

Multiple Entries? ☐

Date of publication 1996

Assessment method

Notes federal wetland delineation methods compared to hydrologic data

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **EPW: A Procedure for the Functional Assessment of Planned Wetlands**

Reference: Water, Air, and Soil Pollution

Author(s) Candy C. Bartoldus

Publisher

Volume number 77

Issue number

Page(s) 533-541

Multiple Entries? ☐

Date of publication 194

Assessment method Evaluation for Planned Wetlands (EPW)

Notes

Goals of method To assess the replacement of wetland function.

Uses of method
impact analysis
watershed management
priority ranking for wetland acquisition and protection

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:
shoreline bank erosion control
sediment stabilization
water quality

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☑ **Can be used as a guide for design?**

Title **Estimating Relative Wetland Values for Regional Planning**

Reference: Wetlands

Author(s) Hruby, Thomas
Cesanek, William E.
Miller, Keith E.

Publisher

Volume number 15

Issue number 2

Page(s) 93-106

Multiple Entries? ☐

Date of publication 1995

Assessment method Indicator Value Assessment (IVA)

Notes We have a report of IVA's development and use in Hackensack Meadowlands Special Area Management Plan (SAMP), NJ.

Goals of method To describe a standard process by which regional models of performance and value can be developed.

Uses of method To modify existing methods to meet local planning needs.
To assess possible impacts from different scenarios.
To identify compensation needs within a planning region.
To assess the potential of different wetlands for enhancement.

Status of use

Regions of testing Hackensack Meadowlands Special Area Management Plan (SAMP), NJ

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed: M=Meadowlands MC=Mill Creek LS=Lower Snohomish
nutrient uptake (M, MC, LS)

Indicators of functions/values

Regions of application: Hackensack Meadowlands Special Area Management Plan (SAMP), NJ
Mill Creek SAMP, WA

Wetland types

Examples of method application: IVA was tested and used in the 3 areas.

Strenths of method: Provides a separate estimate of the performance of a socially important function within a wetland as well as an estimate of the

Limitations of method: Does not provide a measure of absolute performance or value.

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Evaluating and modeling flood potential in ungaged high relief basins in east Tennessee: A hydrogeomorphic approach**

Reference: Dissertation Abstracts International

Author(s) Gailya T. Glawson

Publisher

Volume number 57-10

Issue number section B

Page(s) 6149

Multiple Entries? ☐

Date of publication

Assessment method HGM

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Evaluating Performance of Wetland Restoration Activities**

Reference: Wetland Bioassessment Fact Sheet (EPA843-F-98-001)

Author(s) Thomas J. Danielson

Publisher US EPA

Volume number

Issue number

Page(s)

Multiple Entries? ☐

Date of publication 1998

Assessment method biological assessment to assess wetland restoration success

Notes

Goals of method To evaluate the success of wetland restoration activities.

Uses of method

Status of use in development

Regions of testing Delmarva Bays, Maryland

Wetlands types tested depressional, freshwater wetlands

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: depressional, freshwater wetlands

Functions/values assessed: hydrology and soil
water chemistry
vascular plants

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Evaluating the effects of wetland regulation through hydrogeomorphic classification and landscape profiles**

Reference: Wetlands

Author(s) Stephanie E. Gwin
Mary E. Kentula
Paul W. Shaffer

Publisher

Volume number 19

Issue number 3

Page(s) 477-489

Multiple Entries? ☐

Date of publication 1999

Assessment method Hydrogeomorphic Aproach (HGM)

Notes

Goals of method

Uses of method

Status of use

Regions of testing Portland, Oregon vicinity

Wetlands types tested depression, riverine, slope, lacustrine fringe, depression-

Results of testing Landscape profiles, which describe patterns of diversity of wetlands in a region, can be used as a standard for characterizing a resource and quantifying effects of management decisions.

Classified 45 naturally occurring wetlands (NOWs) and 51 mitigation wetlands (MWs) into regional HGM classes to developed corresponding landscape profiles.

Developed new HGM classes to describe MWs: depression-in-riverine setting, in-stream-depression, depression-in-slope-setting.

Shows that cumulative effects of management decisions can be effectively discerned through HGM classification and landscape profile development.

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Evaluation for Planned Wetlands (EPW)**

Reference: http://www.wetland.org/epwtoc.htm

Author(s) Candy C. Bartoldus

Publisher Environmental Concern, Inc.

Volume number

Issue number

Page(s)

Multiple Entries? ☐

Date of publication

Assessment method Evaluation for Planned Wetlands (EPW)

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed: shoreline bank erosion control
sediment stabilization
water quality

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Evaluation of US EPA Environmental Monitoring & Assessment Program's (EMAP)-Wetlands Sampling Design and Classification**

Reference: Environmental Management

Author(s) Ted L. Ernst
Nancy C. Leibowitz
Denis Rose
Steve Stehman
N. Scott Urquhart

Publisher

Volume number 19

Issue number 1

Page(s) 99-113

Multiple Entries? ☐

Date of publication 1995

Assessment method EMAP

Notes

Goals of method

Uses of method

Status of use testing

Regions of testing Illinois
North Dakota

Wetlands types tested

Results of testing Evaluated EMAP classification system and sampling design using NWI digital wetlands data.

Relative #'s, of wetlands, total areas, average areas, & common vs. rare classes were compared between EMAP & NWI clasifications. EMAP classification provided fewer classess w/more wetlands per class than NWI without altering total wetland area.

Summary statistics that compared sample estimates to true population parameters showed that EMAP's sampling design is effective except for rare EMAP classess in some regions.

Although simple random sampling is inadequate for both small and large wetlands, EMAP is readily adapted to provide better estimates for these categories.

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Exotic grass competition in suppressing native shrubland re-establishment**

Reference: restoration Ecology

Author(s) Scott A. Eliason
Edith B. Allen

Publisher

Volume number 5

Issue number 3

Page(s) 245-255

Multiple Entries? ☐

Date of publication 1997

Assessment method

Notes Examines the mechanisms by which the exotic grass continues to exclude the native sage scrub in some coastal areas of California.

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Forested wetlands of low order streams in the inner coastal plain of North Carolina**

Reference: Wetlands

Author(s) Richard D. Rheinhardt
Martha Craig Rheinhardt
Mark M. Brinson
Karl Faser

Publisher

Volume number 18

Issue number 3

Page(s) 365-378

Multiple Entries? ☐

Date of publication 1998

Assessment method Forested wetlands of low order streams in the inner coastal plain of North Carolina

Notes Quantified geomorphic and vegetational characterisitcs of 22 1st-4th order riverine forests located in the inner coastal plain of North Carolina. Metrics obtained from these relatively unaltered ecosystems could be used to develop standards for assessing wetland condition and provide appropriate criteria for designing restoration of altered low order riverine ecosystems.

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Functional analysis of a two-year-old created in-stream wetland - Hydrology, phosphorus retention, and vegetation survival and growth**

Reference: Wetlands

Author(s) S. F. Niswander
W. J. Mitsch

Publisher

Volume number 15

Issue number 3

Page(s) 212-225

Multiple Entries? ☐

Date of publication 1995

Assessment method

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Functional assessment of five wetlands constructed to mitigate wetland loss in Ohio, USA**

Reference: Wetlands

Author(s) Renee F. Wilson
William J. Mitsch

Publisher

Volume number 16

Issue number 4

Page(s) 436-451

Multiple Entries? ☐

Date of publication 1996

Assessment method Functional assessment of five wetlands constructed to mitigate wetland loss in Ohio, USA

Notes Five replacement wetlands in Ohio were investigated to determine their ecological and legal success.

Goals of method To determine ecological and legal success of five reconstructed wetlands in Ohio.

Uses of method

Status of use

Regions of testing Portage, Ohio
Delaware. OH

Wetlands types tested

Results of testing To evaluation creation success:
1. 1-2 years of monitoring is too short ; evaluations over as long a period of time as possible (10-20yrs.) are desireable.
2. Vegetation characteristics are useful but do not necessarily indicate function; at a minimum, several parameters should be used.
3. Chemical/physical aspects of wetland soils are also useful in evaluating trends.
4. Local reference wetlands are critical for comparative purposes.
5. Some wetlands should be created w/caution because they have failed in the past or we know little about their wetland types.

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: created or restored wetlands

Functions/values assessed: hydrology and hydrogeomorphology
soils
vegetation

Indicators of functions/values 1. Hydrology and hydrogeomorphology

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Functional equivalency trajectories of the restored Gog-le-hi-te estuarine wetland**

Reference: Ecological Applications

Author(s) C. A. Simenstad
R. M. Thom

Publisher

Volume number 6

Issue number 1

Page(s) 38-56

Multiple Entries? ☐

Date of publication 1996

Assessment method

Notes tested ability to predict long-term trends in success of restoration projects

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **GIS Watershed Assessment Model for Suwannee River Basin**

Reference: http://www.epa.gov/owowwtrl1/watershed/Proceed/bottcher.html

Author(s) Del B. Bottcher
Jeffrey G. Hiscock

Publisher

Volume number

Issue number

Page(s)

Multiple Entries? ☐

Date of publication 1995

Assessment method GIS Watershed Assessment Model for Suwannee River Basin

Notes

Goals of method To identify and develop specific criteria and assessment algorithms that reflect the relative land use, soils, and hydrology on discharge water quality, wetlands values, and flooding impacts.

Uses of method To determine current areas under environmental stress. To estimate future impacts of land use management decisions.

Status of use

Regions of testing Suwannee River, Florida

Wetlands types tested

Results of testing Wanted to identify and develop specific criteria and assessment algorithms that reflect the relative land use, soils, and hydrologyy on the discharge water quality, wetlands values, and flooding impacts.

Model development and testing were not complete at time of article.

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed: water quantity
nitrogen
phosphorous

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method: Results are not intended to provide precise load estimates for individual parameters, but are intended to provide a relative index of potential

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Habitat Evaluation at Rocky Mountain Arsenal**

Reference: http://web6.ead.anl.gov/~web//newead/prgprj/proj/rkymtn/rkymtn.htm

Author(s)

Publisher Environmental Assessment Division (of Argonne National Laboratory)

Volume number

Issue number

Page(s)

Multiple Entries? ☐

Date of publication accessed 6/12/00

Assessment method Habitat Evaluation Procedure (HEP)

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Habitat Suitability Index Model Availability for Wetland Cover Types (WRP Technical Note FW-RS-2.1)**

Reference:

Author(s) US Army Corps of Engineers

Publisher

Volume number

Issue number

Page(s) 16

Multiple Entries? ☐

Date of publication 1998

Assessment method Habitat Evaluation Procedure (HEP) and Habitat Suitability Index (HSI)

Notes Summarizes information from 66 HSI models for wildlife species that use wetland cover types - includes specific wetlands for which models apply, states in which the species occurs, and taxonomic groupings [does not include HIS models for fish species].

New Jersey has 26 HSI models for wildlife.

Goals of method To quantify habitat value for fish and wildlife and to compare project or mitigation alternatives.

Uses of method To quantify habitat value for fish and wildlife.
To compare project or mitigation alternatives.

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: evergreen forested wetland (EFW), deciduous forested wetland (DFW), evergreen scrub-shrub wetland (ESW), deciduous scrub-shrub wetland (DSW), herbaceous wetland (HW), shore, bottom wetland (SBW), riverine (R), lacustrine (L), estuarine (E), & marine (M)

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method: The lack of HSI models for reptile and amphibians, and invertebrates represents a significant gap in the HSI model series.

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **HGM Classification**

Reference: Wetlands: Biological Assessment Methods and Criteria Development Workshop

Author(s) M.M. Brinson
E.J. Clairain, Jr.
L.C. Lee
D. Smith

Publisher US EPA

Volume number

Issue number

Page(s) 29

Multiple Entries? ☐

Date of publication 1996

Assessment method Hydrogeomorphic Approach (HGM)

Notes article deals with the classification system within HGM.

Goals of method To classify wetlands based on hydrologic & geomorphic characteristics responsible for maintaining many of the functional aspects of wetlands.

Uses of method

Status of use in development

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: riverine, depressional, slope, organic soil flats, mineral soil flats, estuarine fringe, & lacustrine fringe

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method: Controls for some of the natural variation in wetlands and helps assessors distinguish between natural and anthropogenic variation.

Limitations of method: Once HGM classification is developed for a region, biotic components become critical in assessing ecosystem condition.

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **HGM: Hydrogeomorphic Assessment**

Reference: Ecological Assessment Techniques and Models (http://www.epa.gov/ednnrmrl/tools/model/hgm.htm)

Author(s) Daniel Smith

Publisher US Environmental Protection Agency

Volume number

Issue number

Page(s)

Multiple Entries? ☐

Date of publication

Assessment method Hydrogeomorphic Approach (HGM)

Notes Steps:
1. Classify wetland according to HGM properties.
2. Make connections between the properties of each wetland class and the ecological functions that they perform based on logic & research.
3. Develop functional profiles for each wetland class.
4. Choose reference wetlands that represent the range of both natural and human-imposed stresses and disturbances.
5. Design the assessment method using indicators calibrated to reference wetlands.

Goals of method A hydrogeomorphic classification and assessment methodology for determining the integrity of physical, chemical, and biological functions of wetlands as they compare to reference conditions.

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method: Focuses on identifying wetland groups that exhibit a relatively narrow range of variation in the properties that fundamentally influence

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Hydrogeomorphic (HGM) Assessment - A test of user consistency**

Reference: Wetlands

Author(s)
Dennis F. Whigham
Lyndon C. Lee
Mark M. Brinson
Richard D. Rheinhardt
Mark C. Rains
Jeffrey A. Mason
Humaira Kahn
Melanie B. Ruhlman
Wade L. Nutter

Publisher

Volume number 19

Issue number 3

Page(s) 560-569

Multiple Entries? ☐

Date of publication 1999

Assessment method Hydrogeomorphic Approach (HGM)

Notes The first test of user consistency in application of HGM.

Goals of method

Uses of method

Status of use

Regions of testing Coastal Plain of Delaware, Maryland, and Virginia

Wetlands types tested 44 riverine wetlands

Results of testing The first test of user consistency in application of HGM.

Over a 3-week period, two teams of individuals trained in HGM assessed 44 riverine wetlands on the Coastal Plain of Delaware, Maryland, and Virginia.

A high degree of agreement was shown between groups for the Variable Subindices and Functional Capacity Index --> indicates that the models are robust and result are repeatable.

When used were not repeatable, functional capacity scores were negatively affected - especially functions that only had a few variables --> indicates that it is important to only use variables whose measures are repeatable.

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: riverine wetlands in the Coastal Plain of Delaware, Maryland, and Virginia

Functions/values assessed:
1. dynamic surface water storage
2. long-term surface water storage
3. energy dissipation

Indicators of functions/values (number indicates function number to the left)
tree basal area (1,7,8,10)

Regions of application:

Wetland types

Examples of method application:

Strenths of method: Models are robust and result are repeatable.

Limitations of method: It is important to only use variables whose measures are repeatable.

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Hydrogeomorphic (HGM) Assessment - A test of user consistency**

Reference: Masters Abstracts International

Author(s) Elba Anthony Dardeau, Jr.

Publisher

Volume number 34-06

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Page(s) 2323

Multiple Entries? ☐

Date of publication

Assessment method HGM

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Identification of methodologies for the assessment of wetland functions and values**

Reference: Proceedings of the National Wetland Assessment Symposium, Portland, Maine, June 1985

Author(s) Robert I. Lonard
Ellis J. Clairain Jr.

Publisher Jon A. Kusler and Patricia Riexinger (eds.)

Volume number

Issue number

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Multiple Entries? ☑

Date of publication 1985

Assessment method Wetland Values: Concepts and Methods for Wetlands Evaluation

Notes Identifies 25 wetland evaluation methodologies that met the criteria of the U.S. Army Engineer Waterways Experiment Station (WES)

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed: natural biological functions (including food chain productivity and habitat)

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

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Date of publication 1985

Assessment method Classification and Evaluation of Freshwater Wetlands as Wildlife Habitat in the Glaciated Northeast

Notes Identifies 25 wetland evaluation methodologies that met the criteria of the U.S. Army Engineer Waterways Experiment Station (WES)

Goals of method To provide a detailed classification system for wetland.

To evaluate wetlands for wildlife habitat

Uses of method To arrange wetlands according to their wildlife value for decision making.

Status of use

Regions of testing Massachusetts

Wetlands types tested over 150 wetlands

Results of testing two-year field study

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed: wildlife habitat

Indicators of functions/values dominant life form of vegetation
surface water depth and permanence
size categories

Regions of application: the system has been used in numerous states on thousands of wetlands

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

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☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

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Date of publication 1985

Assessment method Assessment for Visual/Cultural Values

Notes Identifies 25 wetland evaluation methodologies that met the criteria of the U.S. Army Engineer Waterways Experiment Station (WES)

Goals of method To measure the social values of natural open space and recreational sources.

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application: Massachusetts

Wetland types freshwater wetlands

Examples of method application:

Strenths of method:

Limitations of method:

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Reference: Proceedings of the National Wetland Assessment Symposium, Portland, Maine, June 1985

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Ellis J. Clairain Jr.

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Date of publication 1985

Assessment method Priority Rating of Wetlands for Acquisition

Notes Identifies 25 wetland evaluation methodologies that met the criteria of the U.S. Army Engineer Waterways Experiment Station (WES)

Goals of method To rate wetlands according to a priority for aquisition.

Uses of method To guide the aquisition of inland wetlands under New York State's Envirnmental Quality Bond Act of 1972.

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: inland wetlands

Functions/values assessed: biological productivity
vulnerability
additional factors

Indicators of functions/values

Regions of application:

Wetland types 130 inland wetlands

Examples of method application:

Strenths of method:

Limitations of method:

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☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

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Date of publication 1985

Assessment method Evaluation System for Wetlands of Ontario South of the Precambrian Shield

Notes Identifies 25 wetland evaluation methodologies that met the criteria of the U.S. Army Engineer Waterways Experiment Station (WES)

Goals of method To evaluate a wide variety of wetland functions.

Uses of method To evaluate and rank a wide variety of inland wetlands located in Ontario, south of the Precambrian Shield.

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: inland wetlands located in Ontario, south of the Precambrian Shield

Functions/values assessed: biological
social
hydrologic

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

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Date of publication 1985

Assessment method Effects of Wetlands on Water Quality

Notes Identifies 25 wetland evaluation methodologies that met the criteria of the U.S. Army Engineer Waterways Experiment Station (WES)

Goals of method To determine the effect of wetlands on water quality

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

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Date of publication 1985

Assessment method Environmental Evaluation System (EES)

Notes Identifies 25 wetland evaluation methodologies that met the criteria of the U.S. Army Engineer Waterways Experiment Station (WES)

Goals of method To conduct environmental impact analysis in four main categories: ecology, envirnmental pollution, aesthetics, and human interest.

Uses of method To measure selected environmental impacts of large-scale water resource development projects in environmental impact units (EIU)

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values 78 parameters

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

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Date of publication 1985

Assessment method Models for Assessment of Freshwater Wetlands (Larson Method)

Notes Identifies 25 wetland evaluation methodologies that met the criteria of the U.S. Army Engineer Waterways Experiment Station (WES)

Goals of method To identify outstanding wetlands that should be protected at all costs.

To develop the economic values of wetlands to those wetlands that do not meet the criteria for outstanding wetlands.

Uses of method To be used by local, regional, and state resource planners and wetlands regulation agencies.

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed: 4 submodels:
1. wildlife
2. visual/cultural

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Identification of methodologies for the assessment of wetland functions and values**

Reference: Proceedings of the National Wetland Assessment Symposium, Portland, Maine, June 1985

Author(s) Robert I. Lonard
Ellis J. Clairain Jr.

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Volume number

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Date of publication 1985

Assessment method Method for Assessing Wetland Characteristics and Values

Notes Identifies 25 wetland evaluation methodologies that met the criteria of the U.S. Army Engineer Waterways Experiment Station (WES)

Goals of method To identify the relative importance of wetlands in providing wildlife habitat, flood control, and improvement of surface water quality.

Uses of method To provide decision-makers with readily accessible and comparative information on wetland values.

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed: wildlife habitat
flood control
improvement of surface water quality

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

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Date of publication 1985

Assessment method Michigan DNR Wetland Evaluation Technique

Notes Identifies 25 wetland evaluation methodologies that met the criteria of the U.S. Army Engineer Waterways Experiment Station (WES)

Goals of method To assist decision makers on permit applications where significant impacts are anticipated.

To consider cummulative cultural/historic and economic impacts.

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed: hydrology
soils
wildlife habitat/use

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

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Ellis J. Clairain Jr.

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Volume number

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Multiple Entries? ☐

Date of publication 1985

Assessment method Wetland Evaluation Methodology (WEM)

Notes Identifies 25 wetland evaluation methodologies that met the criteria of the U.S. Army Engineer Waterways Experiment Station (WES)

A shortened and revised version of the Federal Highway Methodology tailored to Wisconsin wetlands and regional conditions.

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: wetland in Wisconsin

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Identification of methodologies for the assessment of wetland functions and values**

Reference: Proceedings of the National Wetland Assessment Symposium, Portland, Maine, June 1985

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Ellis J. Clairain Jr.

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Date of publication 1985

Assessment method Wetland Evaluation System (WES)

Notes Identifies 25 wetland evaluation methodologies that met the criteria of the U.S. Army Engineer Waterways Experiment Station (WES)

Goals of method To evaluate human impact on a wetland ecosystem

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

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Title **Identification of methodologies for the assessment of wetland functions and values**

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Author(s) Robert I. Lonard
Ellis J. Clairain Jr.

Publisher Jon A. Kusler and Patricia Riexinger (eds.)

Volume number

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Date of publication 1985

Assessment method Wetlands Evaluation Criteria

Notes Identifies 25 wetland evaluation methodologies that met the criteria of the U.S. Army Engineer Waterways Experiment Station (WES)

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: coastal wetlands in MA

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

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Title **Identification of methodologies for the assessment of wetland functions and values**

Reference: Proceedings of the National Wetland Assessment Symposium, Portland, Maine, June 1985

Author(s) Robert I. Lonard
Ellis J. Clairain Jr.

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Date of publication 1985

Assessment method Federal Highway Administration's Wetland Functional Assessment

Notes Identifies 25 wetland evaluation methodologies that met the criteria of the U.S. Army Engineer Waterways Experiment Station (WES)

3 procedures in the method:
1. Threshold Analysis - estimates probability that a wetland is high, moderate, or low for each of 11 wetland functions
2. Comparative Analysis - estimates whether one wetland is likely to be more important than another for each wetland function
3. Mitigation Analysis - provides outline for comparing mitigation alternatives and their reasonableness

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed: 11 functions

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

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☐ **Can be used as a guide for design?**

Title **Identification of methodologies for the assessment of wetland functions and values**

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Publisher Jon A. Kusler and Patricia Riexinger (eds.)

Volume number

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Multiple Entries? ☑

Date of publication 1985

Assessment method Ecological Effects on Highway Fills of Wetlands

Notes Identifies 25 wetland evaluation methodologies that met the criteria of the U.S. Army Engineer Waterways Experiment Station (WES)

Goals of method To determine the ecological effects that may result from the placement of highway fills on wetlands and associated floodplains.

To suggest procedures by which negative effects can be minimized or avoided.

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed: physical
biological
chemical

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

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Date of publication 1985

Assessment method Analysis of Selected Functional Characteristics of Wetlands

Notes Identifies 25 wetland evaluation methodologies that met the criteria of the U.S. Army Engineer Waterways Experiment Station (WES)

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed: water quality improvements
groundwater recharge
storm and floodwater storage

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

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☐ **Can be used as a guide for design?**

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Date of publication 1985

Assessment method Habitat Evaluation Procedure (HEP)

Notes Identifies 25 wetland evaluation methodologies that met the criteria of the U.S. Army Engineer Waterways Experiment Station (WES)

Goals of method To document the quality and quantity of available habitat for selected wildlife species.

Uses of method To determine the impact of proposed or anticipated land and water changes on wildlife habitat.

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

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Issue number

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Multiple Entries? ☑

Date of publication 1985

Assessment method Assessment for Visual/Cultural Values

Notes Identifies 25 wetland evaluation methodologies that met the criteria of the U.S. Army Engineer Waterways Experiment Station (WES)

Goals of method To incorporate visual-cultural values in the process of land-use allocation of inalnd wetland in MA.

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: inland wetlands

Functions/values assessed: visual value
recreational value
education value

Indicators of functions/values

Regions of application: Massachusetts

Wetland types inland wetlands

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Identification of methodologies for the assessment of wetland functions and values**

Reference: Proceedings of the National Wetland Assessment Symposium, Portland, Maine, June 1985

Author(s) Robert I. Lonard
Ellis J. Clairain Jr.

Publisher Jon A. Kusler and Patricia Riexinger (eds.)

Volume number

Issue number

Page(s)

Multiple Entries? ☑

Date of publication 1985

Assessment method Environmental Evaluation of Coastal Wetlands

Notes Identifies 25 wetland evaluation methodologies that met the criteria of the U.S. Army Engineer Waterways Experiment Station (WES)

Goals of method To evaluate coastal wetlands based on vegetation type.

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: tidal marshes and swamps in Maryland

Functions/values assessed: 32 distinct vegetation types

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Identification of methodologies for the assessment of wetland functions and values**

Reference: Proceedings of the National Wetland Assessment Symposium, Portland, Maine, June 1985

Author(s) Robert I. Lonard
Ellis J. Clairain Jr.

Publisher Jon A. Kusler and Patricia Riexinger (eds.)

Volume number

Issue number

Page(s)

Multiple Entries? ☑

Date of publication 1985

Assessment method Arkansas Wetlands Classification System

Notes Identifies 25 wetland evaluation methodologies that met the criteria of the U.S. Army Engineer Waterways Experiment Station (WES)

Goals of method A two-part, multivariate approach to evaluate freshwater wetlands for maximum wildlife production and diversity.

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: freshwater wetlands

Functions/values assessed: wildlife production
wildlife diversity

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Identification of methodologies for the assessment of wetland functions and values**

Reference: Proceedings of the National Wetland Assessment Symposium, Portland, Maine, June 1985

Author(s) Robert I. Lonard
Ellis J. Clairain Jr.

Publisher Jon A. Kusler and Patricia Riexinger (eds.)

Volume number

Issue number

Page(s)

Multiple Entries? ☑

Date of publication 1985

Assessment method Evaluation of Virginia Wetlands

Notes Identifies 25 wetland evaluation methodologies that met the criteria of the U.S. Army Engineer Waterways Experiment Station (WES)

Goals of method To recognize wetlands that possess great ecological significance as well as those that possess less significance.

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: wetland in VA

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Identification of methodologies for the assessment of wetland functions and values**

Reference: Proceedings of the National Wetland Assessment Symposium, Portland, Maine, June 1985

Author(s) Robert I. Lonard
Ellis J. Clairain Jr.

Publisher Jon A. Kusler and Patricia Riexinger (eds.)

Volume number

Issue number

Page(s)

Multiple Entries? ☑

Date of publication 1985

Assessment method Approach to the Valuation of Florida Freshwater Wetlands

Notes Identifies 25 wetland evaluation methodologies that met the criteria of the U.S. Army Engineer Waterways Experiment Station (WES)

Goals of method to estimate the relative ecological and functional value of FL freshwater wetlands.

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: freshwater wetlands in FL

Functions/values assessed: water quality enhancement
water detention
vegetation diversity and productivity

Indicators of functions/values wetland size
contiguity

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Identification of methodologies for the assessment of wetland functions and values**

Reference: Proceedings of the National Wetland Assessment Symposium, Portland, Maine, June 1985

Author(s) Robert I. Lonard
Ellis J. Clairain Jr.

Publisher Jon A. Kusler and Patricia Riexinger (eds.)

Volume number

Issue number

Page(s)

Multiple Entries? ☑

Date of publication 1985

Assessment method Habitat Evaluation System (HES)

Notes Identifies 25 wetland evaluation methodologies that met the criteria of the U.S. Army Engineer Waterways Experiment Station (WES)

Goals of method To determine the quality of major habitat types based on the habitat characteristics.

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Impacts of Section 404 permits requiring compensatory mitigation of freshwater wetlands in Texas and Arkansas**

Reference: The Texas Journal of Science

Author(s) Jean C. Sifneos
Mary E. Kentula
Paul Price

Publisher

Volume number 44

Issue number 4

Page(s) 475-485

Multiple Entries? ☐

Date of publication 1992

Assessment method

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Implementation of Executive Order 11990: The Real World**

Reference: Proceedings of the National Wetland Assessment Symposium, Portland, Maine, June 1985

Author(s) Charles DesJardins

Publisher Jon A. Kusler and Patricia Riexinger (eds.)

Volume number

Issue number

Page(s)

Multiple Entries? ☐

Date of publication 1985

Assessment method

Notes Identifies problems associated in applying an assessment method:
1. Integration of wetland analysis into the overall envionmental assessment evaluation
2. Repeatability of the assessment methodology
3. Legal standing of the assessment methodology
4. Cataloging of the individual wetland analysis

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Integrating Assessment Programs**

Reference: Wetlands: Biological Assessment Methods and Criteria Development Workshop

Author(s)

Publisher US EPA

Volume number

Issue number

Page(s) 29

Multiple Entries? ☑

Date of publication 1996

Assessment method bioassessment

Notes

Goals of method Quantify biological integrity of wetlands to refine state water quality standards & biological criteria (CWA 303).

Take direct measurements of biota & often combine metrics into an overall index of biological integrity.

Uses of method To track wetland condition. To identify impairment & diagnose souces of impairment. To prioritize protection & restoration efforts. To establish restoration goals & set performance standards for mitigation projects.

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method: time & resource intensive during development

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Integrating Assessment Programs**

Reference: Wetlands: Biological Assessment Methods and Criteria Development Workshop

Author(s)

Publisher US EPA

Volume number

Issue number

Page(s) 29

Multiple Entries? ☑

Date of publication 1996

Assessment method Hydrogeomorphic Approach (HGM)

Notes

Goals of method A rapid, functional assessment methodology to improve Clean Water Act 404 permitting and mitigation decisions.

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **introductin to Chapter 5: The Regulator's Perspective**

Reference: Proceedings of the National Wetland Assessment Symposium, Portland, Maine, June 1985

Author(s)

Publisher Jon A. Kusler and Patricia Riexinger (eds.)

Volume number

Issue number

Page(s) 123

Multiple Entries? ☐

Date of publication 1985

Assessment method

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Introduction (to HEP)**

Reference: http://www.wldelft.nl/cons/disc/eco/hep/intro.htm

Author(s)

Publisher WL I Delft Hydraulics

Volume number

Issue number

Page(s)

Multiple Entries? ☐

Date of publication 2000 (accessed 6/12/00)

Assessment method Habitat Evaluation Procedure (HEP)

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **introduction to Chapter 4. Comprehensive Assessment Methods**

Reference: Proceedings of the National Wetland Assessment Symposium, Portland, Maine, June 1985

Author(s)

Publisher Jon A. Kusler and Patricia Rieximnger, eds.

Volume number

Issue number

Page(s) 65

Multiple Entries? ☑

Date of publication 1985

Assessment method Wetland Evaluation Technique (WET)

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Introduction to HGM**

Reference: Wetlands: Biological Assessment Methods and Criteria Development Workshop

Author(s) M.M. Brinson
E.J. Clairain, Jr.
L.C. Lee
D. Smith

Publisher US EPA

Volume number

Issue number

Page(s) 29

Multiple Entries? ☐

Date of publication 1996

Assessment method Hydrogeomorphic Approach (HGM)

Notes

Goals of method To compromise between utilizing comprehensive data and relying on the expertise of scientists.
To ensure that HGM is applicable to 404 and that it focuses on functions - not values.

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Introduction, Wetland Assessment: The Regualtors Perspective**

Reference: Proceedings of the National Wetland Assessment Symposium, Portland, Maine, 17-20 June 1985

Author(s) Jon A. Kusler

Publisher Jon A. Kusler and Patricia Riexinger (eds.)

Volume number

Issue number

Page(s)

Multiple Entries? ☑

Date of publication 1985

Assessment method

Notes Outlines the assessment needs for regulatory and management purposes and identifies principal issues and approaches that are discussed within the proceedings.

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Landscape features as predictors of the functional performance of wetlands**

Reference: Dissertation Abstracts International

Author(s) James Marshall Eames

Publisher Dissertation Abstracts International

Volume number 59-04

Issue number section B

Page(s) 1460

Multiple Entries? ☐

Date of publication

Assessment method

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Literature review of wetland evaluation methodologies**

Reference: technical report

Author(s)

Publisher USEPA

Volume number

Issue number

Page(s)

Multiple Entries? ☐

Date of publication 1984

Assessment method

Notes on microfiche

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Long-term evaluation of wetland creation projects**

Reference: Wetland Creation & Resotration

Author(s) Charlene D'Avanzo

Publisher

Volume number

Issue number

Page(s)

Multiple Entries? ☐

Date of publication

Assessment method Long-term evaluation of wetland creation projects

Notes Hydrology is an important factor in determining wetland community changes over time.

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values 1. comparison of vegeation growth characteristics (ie. biomass or density) in artificial & natural

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Measuring habitat for wildlife potential, & using aquatic invertebrate biomonitoring to evaluate biological integrity in freshwater wetlands**

Reference: Wetlands: Biological Assessment Methods and Criteria Development Workshop

Author(s) A.L. Hicks

Publisher US EPA

Volume number

Issue number

Page(s) 29

Multiple Entries? ☑

Date of publication 1996

Assessment method Invertebrate Biotic Index & Habitat Assessment

Notes

Goals of method A rapid assessment methodology to measure wetland biotic integrity using aquatic invertebrates w/suitable metric indicators accompanied by a Habitat Assessment that incorporates key landscape and wetland indicators.

Uses of method

Status of use in development

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: freshwater wetlands

Functions/values assessed: biological integrity

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method: Can detect whether impacts are due to habitat degradation or to some other cause (e.g., chemical pollution).

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Measuring habitat for wildlife potential, & using aquatic invertebrate biomonitoring to evaluate biological integrity in freshwater wetlands**

Reference: Wetlands: Biological Assessment Methods and Criteria Development Workshop

Author(s) A.L. Hicks

Publisher US EPA

Volume number

Issue number

Page(s) 29

Multiple Entries? ☑

Date of publication 1996

Assessment method WEThings

Notes

Goals of method A habitat assessment protocol using landscape and wetland indicators to predict possible presence of wetland-dependant amphibians, reptiles, and mammals.

Uses of method

Status of use applied

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: wetlands in New England

Functions/values assessed: amphibian, reptile, & mammal habitat

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method: Based on extensive literature review of measurable habitat conducted for each list species which serve as the basis for predictive

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Methods for Evaluating Wetland Functions (WRP Technical Report WG-EV-2.2)**

Reference:

Author(s) US Army Corps of Engineers

Publisher US Army Corps of Engineers

Volume number

Issue number

Page(s) 17

Multiple Entries? ☑

Date of publication 1994

Assessment method Evaluation for Groundwater Resources

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: freshwater wetlands

Functions/values assessed: hydrology/water quality
landscape
recreation/aesthetics

Indicators of functions/values hydrology/water quality:
contribute to groundwater quality

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Methods for Evaluating Wetland Functions (WRP Technical Report WG-EV-2.2)**

Reference:

Author(s) US Army Corps of Engineers

Publisher US Army Corps of Engineers

Volume number

Issue number

Page(s) 17

Multiple Entries? ☑

Date of publication 1994

Assessment method Habitat Evaluation Procedure (HEP)

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed: hydrology/water quality
landscape
wildlife/habitat

Indicators of functions/values (cont'd from #110)
wildlife/habitat:

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Methods for Evaluating Wetland Functions (WRP Technical Report WG-EV-2.2)**

Reference:

Author(s) US Army Corps of Engineers

Publisher US Army Corps of Engineers

Volume number

Issue number

Page(s) 17

Multiple Entries? ☑

Date of publication 1994

Assessment method Habitat Evaluation Procedure (HEP)

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed: hydrology/water quality
landscape
wildlife/habitat

Indicators of functions/values hydrology/water quality:
- abundance of cover in

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Methods for Evaluating Wetland Functions (WRP Technical Report WG-EV-2.2)**

Reference:

Author(s) US Army Corps of Engineers

Publisher US Army Corps of Engineers

Volume number

Issue number

Page(s) 17

Multiple Entries? ☑

Date of publication 1994

Assessment method Method for Assessing Wetland Characteristics and Values

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed: hydrology/water quality
landscape

Indicators of functions/values hydrology/water quality:
contribute to surface water

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Methods for Evaluating Wetland Functions (WRP Technical Report WG-EV-2.2)**

Reference:

Author(s) US Army Corps of Engineers

Publisher US Army Corps of Engineers

Volume number

Issue number

Page(s) 17

Multiple Entries? ☑

Date of publication 1994

Assessment method Habitat Assessment Technique (HAT)

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed: landscape
wildlife/habitat

Indicators of functions/values landscape:
size of wetland
wildlife/habitat:

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Methods for Evaluating Wetland Functions (WRP Technical Report WG-EV-2.2)**

Reference:

Author(s) US Army Corps of Engineers

Publisher US Army Corps of Engineers

Volume number

Issue number

Page(s) 17

Multiple Entries? ☑

Date of publication 1994

Assessment method Assessment for Visual/Cultural Values

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: inland wetlands in MA

Functions/values assessed: landscape
recreation/aesthetics

Indicators of functions/values landscape:
contiguity to stream/lake
edge effect of community types

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Methods for Evaluating Wetland Functions (WRP Technical Report WG-EV-2.2)**

Reference:

Author(s) US Army Corps of Engineers

Publisher US Army Corps of Engineers

Volume number

Issue number

Page(s) 17

Multiple Entries? ☑

Date of publication 1994

Assessment method Models for Assessment of Freshwater Wetlands (Larson Method)

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed: hydrology/water quality
landscape

Indicators of functions/values hydrology/water quality:
water chemistry

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Methods for Evaluating Wetland Functions (WRP Technical Report WG-EV-2.2)**

Reference:

Author(s) US Army Corps of Engineers

Publisher US Army Corps of Engineers

Volume number

Issue number

Page(s) 17

Multiple Entries? ☑

Date of publication 1994

Assessment method Anchorage Assessment

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed: hydrology/water quality
landscape
wildlife/habitat

Indicators of functions/values hydrology/water quality:
- erosion
control

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Methods for Evaluating Wetland Functions (WRP Technical Report WG-EV-2.2)**

Reference:

Author(s) US Army Corps of Engineers

Publisher US Army Corps of Engineers

Volume number

Issue number

Page(s) 17

Multiple Entries? ☑

Date of publication 1994

Assessment method Wildlife Community Habitat Evaluation (WCHE)

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed: hydrology/water quality
landscape
wildlife/habitat

Indicators of functions/values hydrology/water quality:
flooding extension and duration

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Methods for Evaluating Wetland Functions (WRP Technical Report WG-EV-2.2)**

Reference:

Author(s) US Army Corps of Engineers

Publisher US Army Corps of Engineers

Volume number

Issue number

Page(s) 17

Multiple Entries? ☑

Date of publication 1994

Assessment method Cumulative Assessment of BLH

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed: hydrology/water quality
landscape
wildlife/habitat

Indicators of functions/values hydrology/water quality:
contribute to groundwater quality

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Methods for Evaluating Wetland Functions (WRP Technical Report WG-EV-2.2)**

Reference:

Author(s) US Army Corps of Engineers

Publisher US Army Corps of Engineers

Volume number

Issue number

Page(s) 17

Multiple Entries? ☑

Date of publication 1994

Assessment method Wetland Evaluation Methodology (WEM)

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed: hydrology/water quality
landscape
wildlife/habitat

Indicators of functions/values hydrology/water quality:
- condition of
shoreline

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Methods for Evaluating Wetland Functions (WRP Technical Report WG-EV-2.2)**

Reference:

Author(s) US Army Corps of Engineers

Publisher US Army Corps of Engineers

Volume number

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Multiple Entries? ☑

Date of publication 1994

Assessment method Intermountain Riparian Lands Evaluation Methodology

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed: hydrology/water quality
landscape
wildlife/habitat

Indicators of functions/values hydrology/water quality:
- bacterial
concentration

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Methods for Evaluating Wetland Functions (WRP Technical Report WG-EV-2.2)**

Reference:

Author(s) US Army Corps of Engineers

Publisher US Army Corps of Engineers

Volume number

Issue number

Page(s) 17

Multiple Entries? ☑

Date of publication 1994

Assessment method Connecticut Method

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values (cont'd from #122)
recreation/aesthetics

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Methods for Evaluating Wetland Functions (WRP Technical Report WG-EV-2.2)**

Reference:

Author(s) US Army Corps of Engineers

Publisher US Army Corps of Engineers

Volume number

Issue number

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Multiple Entries? ☑

Date of publication 1994

Assessment method Wetlands Evaluation Guide

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values (cont'd from #57)
recreation/aesthetics
add to visual diversity of

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Methods for Evaluating Wetland Functions (WRP Technical Report WG-EV-2.2)**

Reference:

Author(s) US Army Corps of Engineers

Publisher US Army Corps of Engineers

Volume number

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Multiple Entries? ☑

Date of publication 1994

Assessment method Wetland Evaluation Technnique, version 2.0 (WET II)

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed: hydrology/water quality
landscape
wildlife/habitat

Indicators of functions/values hydrology/water quality:
-

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Methods for Evaluating Wetland Functions (WRP Technical Report WG-EV-2.2)**

Reference:

Author(s) US Army Corps of Engineers

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Date of publication 1994

Assessment method North Carolina Method

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:
hydrology/water quality
landscape
wildlife/habitat

Indicators of functions/values
hydrology/water quality:
- bank stabilization
- nutrient removal

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title Methods for Evaluating Wetland Functions (WRP Technical Report WG-EV-2.2)

Reference:

Author(s) US Army Corps of Engineers

Publisher US Army Corps of Engineers

Volume number

Issue number

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Multiple Entries? ☑

Date of publication 1994

Assessment method Wetlands Evaluation Guide

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed: hydrology/water quality
landscape
wildlife/habitat

Indicators of functions/values hydrology/water quality:
- climate
regulation

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Methods for Evaluating Wetland Functions (WRP Technical Report WG-EV-2.2)**

Reference:

Author(s) US Army Corps of Engineers

Publisher US Army Corps of Engineers

Volume number

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Multiple Entries? ☑

Date of publication 1994

Assessment method Connecticut Method

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:
hydrology/water quality
landscape
wildlife/habitat

Indicators of functions/values
hydrology/water quality:
- abundance of cover in
stream/river sediment

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Methods for Evaluating Wetland Functions (WRP Technical Report WG-EV-2.2)**

Reference:

Author(s) US Army Corps of Engineers

Publisher US Army Corps of Engineers

Volume number

Issue number

Page(s) 17

Multiple Entries? ☑

Date of publication 1994

Assessment method New Hampshire Method

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values (cont'd from #120)
wildlife/habitat:

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Methods for Evaluating Wetland Functions (WRP Technical Report WG-EV-2.2)**

Reference:

Author(s) US Army Corps of Engineers

Publisher US Army Corps of Engineers

Volume number

Issue number

Page(s) 17

Multiple Entries? ☑

Date of publication 1994

Assessment method New Hampshire Method

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed: hydrology/water quality
landscape
wildlife/habitat

Indicators of functions/values hydrology/water quality:
- abundance of cover in

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Methods for Evaluating Wetland Functions (WRP Technical Report WG-EV-2.2)**

Reference:

Author(s) US Army Corps of Engineers

Publisher US Army Corps of Engineers

Volume number

Issue number

Page(s) 17

Multiple Entries? ☑

Date of publication 1994

Assessment method A Method for Assessing the Functions of Wetlands (Hollands-Magee Method)

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed: hydrology/water quality
landscape
wildlife/habitat

Indicators of functions/values hydrology/water quality:
- hydrologic

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Methods for Evaluating Wetland Functions (WRP Technical Report WG-EV-2.2)**

Reference:

Author(s) US Army Corps of Engineers

Publisher US Army Corps of Engineers

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Multiple Entries? ☑

Date of publication 1994

Assessment method Ontario Method

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values (cont'd from #117)
wildlife/habitat:
breeding habitat for endangered

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Methods for Evaluating Wetland Functions (WRP Technical Report WG-EV-2.2)**

Reference:

Author(s) US Army Corps of Engineers

Publisher US Army Corps of Engineers

Volume number

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Page(s) 17

Multiple Entries? ☑

Date of publication 1994

Assessment method Ontario Method

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed: hydrology/water quality
landscape
wildlife/habitat

Indicators of functions/values hydrology/water quality:
- erosion control -
flow augmentation

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Methods for Evaluating Wetland Functions (WRP Technical Report WG-EV-2.2)**

Reference:

Author(s) US Army Corps of Engineers

Publisher US Army Corps of Engineers

Volume number

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Multiple Entries? ☑

Date of publication 1994

Assessment method Wetland Evaluation Methodology (WEM)

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values wildlife/habitat:
- dominance of robust

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Methods for Evaluating Wetland Functions (WRP Technical Report WG-EV-2.2)**

Reference:

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Publisher US Army Corps of Engineers

Volume number

Issue number

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Multiple Entries? ☑

Date of publication 1994

Assessment method Wetland Evaluation Technnique, version 2.0 (WET II)

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values (cont'd from 113)
landscape:

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Methods to Determine the Hydrology of Potential Wetland Sites (WRP Technical Note HY-DE-4.1**

Reference:

Author(s) US Army Corps of Engineers

Publisher US Army Corps of Engineers

Volume number

Issue number

Page(s) 6

Multiple Entries? ☐

Date of publication 1998

Assessment method Methods to Determine the Hydrology of Potential Wetland Sites

Notes Article decribes ways to measure wetland hydrology (not associated w/a particular assessment methodology).

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed: hydrology

Indicators of functions/values stream gauge analysis
remote sensing
monitoring wells

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Microbial consortia in wetland sediments: A biomarker analysis of the effects of hydrological regime, vegetation and season on benthic**

Reference: Marine and Freshwater Res.

Author(s) Paul I. Boon
Patti Virtue
Peter D. Nichols

Publisher

Volume number 47

Issue number

Page(s) 27-41

Multiple Entries? ☐

Date of publication 1996

Assessment method

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Mid-Atlantic Integrated Assessment**

Reference: MAIA Working Conference, What Have We Learned from the Research and Monitoring? What Does the Future Hold?, Baltimore, Maryland

Author(s)

Publisher USEPA

Volume number

Issue number

Page(s)

Multiple Entries? ☐

Date of publication Nov 30 - Dec 2, 1998

Assessment method Mid-Atlantic Integrated Assessment (MAIA)

Notes a model ecosystem-based approach being developed by the Epa Region III and the EPA Office of Research and Development with other agencies.

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Minnesota Routine Assessent Method (MnRAM) for Evaluating Wetland Functions - Version 2.0**

Reference:

Author(s)

Publisher Minnesota Department of Environmental Resources?

Volume number

Issue number

Page(s) 44 pp. + 2 2 page se

Multiple Entries? ☐

Date of publication

Assessment method Minnesota Routine Assessment Method, version 2.0 (MnRAM)

Notes User guide and method with info for Lake Elmo sites #1 and #2, North Oaks #1 and #2, and Soberg #1 and #2

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Model development, calibration, and testing**

Reference:	Wetlands: Biological Assessment Methods and Criteria Development Workshop
Author(s)	M.M. Brinson E.J. Clairain, Jr. L.C. Lee D. Smith
Publisher	US EPA
Volume number	
Issue number	
Page(s)	29
Multiple Entries?	☐
Date of publication	1996
Assessment method	Hydrogeomorphic Approach (HGM)
Notes	article deals with HGM model development
Goals of method	To assess the ability of a wetland to perform a specific function relative to other wetlands in a region.
Uses of method	
Status of use	
Regions of testing	
Wetlands types tested	
Results of testing	
Personnel requirements:	
Time requirements:	
Training availability:	
Proposed future revisions:	
Applicable wetland types:	n/a
Functions/values assessed:	
Indicators of functions/values	
Regions of application:	
Wetland types	
Examples of method application:	
Strenths of method:	
Limitations of method:	HGM models must be: 1. sensitive to a range of antropogenic stressors commonly placed on wetlands

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **New England Freshwater Wetlands Invertebrate Biomonitoring Protocol (NEFWIBP)**

Reference:

Author(s) Hicks, Anna L.

Publisher The Environmental Insitute at U. Mass., Natural Resources Environment and Conservation (Umass Extension), and Massachusetts Coastal Zone Management Executive Offic of Environmental Affairs Commonwealth of Massachusetts

Volume number

Issue number

Page(s)

Multiple Entries? ☐

Date of publication June 1997

Assessment method New England Freshwater Wetlands Invertebrate Biomonitoring Protocol (NEFWIBP)

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **New procedures of functional analysis for European wetland ecosystems**

Reference: National Interagency Workshop on Wetlands: Technology Advances for Wetlands Science, New Orleans, LA, April 1995

Author(s) R. J. McInnes
E. Maltby

Publisher USACOE WES

Volume number

Issue number

Page(s)

Multiple Entries? ☐

Date of publication 1995

Assessment method

Notes Functional Assessment of European Wetland Ecoystems (FAEWE) procedures, which rely on the identification and delineation of hydrogeomorphic units (HGMUs)

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Normalization of metal concentrations in estuarine sediments from the Gulf of Mexico**

Reference: Estuaries

Author(s) J. Kevin Summers
Terry L. Wade
Virginia D. Engle
Ziad A. Malaeb

Publisher

Volume number 19

Issue number 3

Page(s) 581-594

Multiple Entries? ☐

Date of publication 1996

Assessment method EMAP

Notes

Goals of method

Uses of method

Status of use applied

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values

Regions of application: Gulf of Mexico

Wetland types estuarine

Examples of method application: Used EMAP to examine metal concetrations in sediemnts from 497 estuary sites in the Gulf of Mexico.

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Note: Water-level fluctuation in wetlands as a function of landscape condition in the prairie pothole region**

Reference: Wetlands

Author(s) Ned H. Euliss, Jr.
David M. Mushet

Publisher

Volume number 16

Issue number 4

Page(s)

Multiple Entries? ☐

Date of publication 1996

Assessment method Water-level fluctuation in wetlands as a function of landscape condition in the prairie pothole region

Notes Evauluated water-level fluctuation in 12 temporary, 12 seasonal, 12 semipermanent wetlands equally distributed among landscapes dominated by tilled agrivultural lands and landscapes dominated by grassland.

Increases in water level fluctuation due to tillage or alteration of ground water hydrology may ultimately affect the composition of a wetland's flora and fauna.

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values water-level fluctuation: (maximum water depth - minimum water depth/catchment size)

Regions of application:

Wetland types

Examples of method application: Evauluated water-level fluctuation in 12 temporary, 12 seasonal, 12 semipermanent wetlands equally

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Oregon Freshwater Assessment Methodology**

Reference:

Author(s) Emily Roth
Richard Olsen
Patty Snow
Richard Summer

Publisher Wetlands Program, Oregon Division of State Lands

Volume number

Issue number

Page(s)

Multiple Entries? ☐

Date of publication 1996

Assessment method Oregon Freshwater Assessment Methodology (OFWAM)

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements: planners, public officials, and other familiar w/wetlands but who are not necessarily wetland specialists

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed: wildlife habitat
fish habitat
water quality

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Periphyton-water quality relationships along a nutrient gradient in the northern Florida Everglades**

Reference: Journal of the North American Benthological Society

Author(s) P. V. McCormick
P. S. Rawlik
K. Lurding
E.P. Smith
F. H. Sklar

Publisher

Volume number 15

Issue number 4

Page(s) 433-449

Multiple Entries? ☐

Date of publication 1996

Assessment method

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Quantifying periphyton responses to phosphorus in the Florida Everglades - A synoptic-experimental approach**

Reference: Journal of the North American Benthological Society

Author(s) P. V. McCormick
M. B. Odell

Publisher

Volume number 15

Issue number 4

Page(s) 450-468

Multiple Entries? ☐

Date of publication 1996

Assessment method

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Rapid Assessment of Vernal Pool Floristics**

Reference: http://www.wes.army.mil/el/workshop/FA2-3.html

Author(s) Kenneth D. Whitney

Publisher

Volume number

Issue number

Page(s)

Multiple Entries? ☐

Date of publication

Assessment method Vernal Pool Floristic Index (VPFI)

Notes

Goals of method Compares the species richness of an individual vernal pool against a rule-based list of known vernal pool species to assess vernal pool function.

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: vernal pools

Functions/values assessed: habitat quality

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Rapid assessment of wetlands: History and application to management**

Reference: Global Wetlands: Old World and New

Author(s) Joseph S. Larson
D. B. Mazzarese

W. J. Mitsch, ed.

Publisher Elselvier Science

Volume number

Issue number

Page(s) 625-636

Multiple Entries? ☐

Date of publication 1994

Assessment method

Notes review

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

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Title **Rapid assessment procedures: radical re-Invention or just sloppy science**

Reference: Human Ecological Risk Assessment

Author(s) Barry R. Taylor

Publisher

Volume number 3

Issue number 6

Page(s) 1005-1016

Multiple Entries? ☐

Date of publication 1997

Assessment method bioassessment (benthic invertebrates)

Notes

Goals of method To dentify water quality problems associated with point-source and nonpoint-source pollution or other anthropogenic effects.
To document long-term changes in water quality within a region.

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Rapid wetland functional assessment: Its role and utility in the regulatory arena**

Reference: Water, Air, and Soil Pollution

Author(s) William B. Ainslie

Publisher

Volume number 77

Issue number

Page(s) 433-444

Multiple Entries? ☐

Date of publication 1994

Assessment method Hydrogeomorphic Approach (HGM)

Notes A functionally-based classification of wetlands which emphasizes the hydrologic and geomorphic controls responsible for maintaining many of the functions of wetlands, and the importance of abiotic features of wetlands for such functions as the chemical characteristics of water, habitat maintenance, and water storage and transport.

Goals of method

Uses of method

Status of use

Regions of testing Drakes Creek, Hopkins County, Kentucky

Wetlands types tested riverine wetlands

Results of testing Based on wetland classification and ecological profile, a project at Drake's Creek would potentially impact several functions associated with wildlife and water quality enhancement. Impacts could be severe, therefore the level of alternatives analysis would be high.

13 functions were identifies at Drakes's Creek - determined by the presence of at least 3 indicators associated w/a particular function.

Functional indicators may also be used to determine if a mitigation site exhibits the same function. Therefore, HGM may be used in site selection for mitigation.

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method: Classifying wetlands into classes with similar functions focuses assessment on processes that are fundamental to the sustained

Limitations of method: It is difficult to deal with establishment, monitoring, and protection of reference sites.

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Regional susceptibility of northeast lakes to zebra mussel invasion**

Reference: Fisheries

Author(s) Thomas R. Whittier
Alan T. Herlihy
Suzanne M. Pierson

Publisher

Volume number 20

Issue number 6

Page(s)

Multiple Entries? ☐

Date of publication 1995

Assessment method EMAP

Notes

Goals of method

Uses of method

Status of use applied

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values

Regions of application: northeastern US
(New England, New York, New Jersey)

Wetland types lakes

Examples of method application: Used water chemistry data from EMAP sampling of 344 lakes to estimate lakes at risk for zebra

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Relationships between vegetation and hydrogeomophic characteristics of British riverine environments: A remotely sensed perspective**

Reference: Dissertation Abstracts International

Author(s) Ian David Hooper

Publisher

Volume number 55-01

Issue number section C

Page(s) 0115

Multiple Entries? ☐

Date of publication

Assessment method remote sensing

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Report to the City of Pacifica on the 75% design for restoring lower Calera Creek & adjacent wetland**

Reference: Wetlands: Biological Assessment Methods and Criteria Development Workshop

Author(s) L.C. Lee

Publisher US EPA

Volume number

Issue number

Page(s) 29

Multiple Entries? ☐

Date of publication 1996

Assessment method Hydrogeomorphic Approach (HGM)

Notes The City of Pacifica, CA proposed to relocate lower Calera Creek, presently a ditched stream on a former quarry site, and restore a riparian zone and associated riverine and depressional wetlands.
The primary goal of the wetland restoration was to improve riverine ecosystem functions including hydrology, water quality, plant community maintenance, and habitat/faunal support.
A secondary goal of the restoration project was to create habitat for the endangered San Francisco Garter Snake and provide optimal conditions for colonization by prey species.

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values

Regions of application: Pacifica, California

Wetland types riverine and depressional wetlands

Examples of method application: HGM was used as the basis for assessing the impact of the proposed project and designing Calera Creek

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Response of a wetland vascular plant community to disturbance - A simulation study**

Reference: Ecological Applications

Author(s) A. M. Ellison
B. L. Bedford

Publisher

Volume number 5

Issue number 1

Page(s) 109-123

Multiple Entries? ☐

Date of publication 1995

Assessment method

Notes simulation of how changes in wetland hydrology due to anthropogenic disturbance changes plant communities

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Restoration, Creation, and Recovery of Wetlands - Wetland Functions, Values, and Assessment**

Reference: National Water Summary on Wetland Resources (http://water.usgs.gov/nwsum/WSP2425/functions.html)

Author(s) Richard P. Novitski
R. Daniel Smith
Judy D. Fretwell

Publisher US Geological Survey

Volume number

Issue number

Page(s)

Multiple Entries? ☑

Date of publication 1995

Assessment method Hydrogeomorphic Approach (HGM)

Notes Represents a combination of WET and EMAP approaches - compares characteristics of an individual wetland to reference wetlands [like EMAP] and uses this information to assess the degree to which an individual wetland performs specific functions [like WET].

HGM is intended to revise and simplify WET while making it more applicable to specific regions.

Goals of method To provide a foundation for assessing the physical, chemical, and biological functions of wetlands.

Uses of method To determine the amount of mitigation required to offset unavoidable wetland loss. To assess the degree of success of individual mitigation projects.

Status of use

Regions of testing Pacific Northwest, Northeast, Rocky Mountains, Southwest, Southeast, North & South Atlantic states, gulf coast states.

Wetlands types tested Riverine (Pacific Northwest, Northeast, Rocky

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method: Wetland indicators are limited to those that are important in the specific region and hydrogeomorphic region.

Limitations of method:

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Title **Restoration, Creation, and Recovery of Wetlands - Wetland Functions, Values, and Assessment**

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Author(s) Richard P. Novitski
R. Daniel Smith
Judy D. Fretwell

Publisher US Geological Survey

Volume number

Issue number

Page(s)

Multiple Entries? ✔

Date of publication

Assessment method EMAP

Notes

Goals of method To develop an approach for assesing the condition of different types of wetlands in a region and in nation as a whole.
To identify indicators of wetland quality, standardize methods of measurement, and establish a national network for monitoring wetlands.

Uses of method To identify the effects of broad policy decisions (ie. "no net loss"), programs (ie., mitigation banking), or natural phenomena (ie., climate change).

Status of use

Regions of testing Gulf of Mexico
prairie pothole region of Midwest

Wetlands types tested salt marshes
prairie pothole wetlands

Results of testing Results of the pilot studies identify the indicators that most efectively differentiate between healthy and degraded wetlands.

1. Salt marshes (Gulf of Mexico):
ratio of vegetated areas to open water, # of plant species (diversity of plant species), biomass (production of plant material/unit area), amount of organic matter in soil, & salinity
2. Prairie potholes:
amount of developed land in the surrounding upland, rates of increase and decrease in the # of water-filled basins or in the area of water surface between April and August, & ratio of temporary to seasonal to semipermanent wetlands
3. Other promising indicators:
diversity of plant species, # and types of species of large invertebrates, range of water-level fluctuation, & sedimentation rate

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed: biologic integrity
habitat integrity
hydrologic integrity

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method: EMAP-Wetlands was supposed to have 3 phases:
1. Pilot studies to evaluate selected indicators.
2. Regional demonstrations using the best

- [ ] Can directly compare wetlands within the same class?
- [ ] Can directly compare wetlands from different classes?
- [ ] Can be used as a guide for design?

Title **Restoration, Creation, and Recovery of Wetlands - Wetland Functions, Values, and Assessment**

Reference: National Water Summary on Wetland Resources (http://water.usgs.gov/nwsum/WSP2425/functions.html)

Author(s) Richard P. Novitski
R. Daniel Smith
Judy D. Fretwell

Publisher US Geological Survey

Volume number

Issue number

Page(s)

Multiple Entries? ☑

Date of publication

Assessment method Wetland Evaluation Technique (WET)

Notes WET assigns values to specific functions of individual wetlands.

Goals of method To provide a balance between costly site-specific studies and the "best professional judgement" approach.

Uses of method To assess habitat-suitability for waterfowl and wetland-dependent birds, fish, and invertebrates.
To determine the amount of mitigation required to offset unavoidable wetland loss.
To assess the degree of success of individual mitigation projects.

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements: Intended to be used by any environmental professional (ie., an engineer can evaluate biological functions & a biologist can evaluate hydrologic functions).

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed: ground water recharge
ground water discharge
floodflow alteration

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application: Has been applied to nearly every type of wetland in every state.

Strenths of method: Evaluates functions and values in terms of effectiveness (the capability to perform a specific function), opportunity (the potential

Limitations of method: Because WET can be applied to any wetland in any state, it can be cumbersome. Users interested interested in a local area must repeatedly enter data

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Riverine wetland function and human-induced ecological disturbance: A watershed perspective**

Reference: Dissertation Abstracts International

Author(s) Julie Mann Edge

Publisher Dissertation Abstracts International

Volume number 58-07

Issue number section B

Page(s) 3534

Multiple Entries? ☐

Date of publication

Assessment method HGM

Notes assessed use of watershed perspective and of HGM

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Seeking suitable endpoints: Biological monitoring in streams and wetlands**

Reference: Wetlands: Biological Assessment Methods and Criteria Development Workshop

Author(s) Dr. James R. Karr

Publisher US EPA

Volume number

Issue number

Page(s) 29

Multiple Entries? ☑

Date of publication 1996

Assessment method Hydrogeomorphic Approach (HGM)

Notes Is HGM broad enough?
Does HGM give enough attention to measured biological endpoints?

The goal for wetland protection programs should be to evaluate the impact of human activity on wetland condition.
Functional criteria may not be enough to protect wetlands. Chemical and functional endpoints do not tell managers what they need to know about the condition of living systems - direct measurements of biological attributes are essential.

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method: Defining functions is limiting; we do not understand the attributes of wetlands well enough to define every function that will be known or

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Title Seeking suitable endpoints: Biological monitoring in streams and wetlands

Reference: Wetlands: Biological Assessment Methods and Criteria Development Workshop

Author(s) Dr. James R. Karr

Publisher US EPA

Volume number

Issue number

Page(s) 29

Multiple Entries? ☑

Date of publication 1996

Assessment method Index of Biotic Integrity (IBI)

Notes Diversity indices are more useful than changes in abundances of species. Multivariate statistics ignore important signals, such as rare species.

Goals of method To detect degradation of living systems
To diagnose likely causes of degradation
To identify management actions that can halt or reverse degradation
To track living systems to find out if restoration efforts have succeeded.

Uses of method To detect degradation of living systems
To diagnose likely causes of degradation
To identify management actions that can halt or reverse degradation
To track living systems to find out if restoration efforts have succeeded.

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed: biotic integrity

Indicators of functions/values species composition
community structure
individual health

Regions of application:

Wetland types

Examples of method application:

Strenths of method: cost effective

Improves ability to protect waterways & their

Limitations of method: Problems to avoid w/IBI:
1. assuming habitat is independent of human activities

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Seeking suitable endpoints: Biological monitoring in streams and wetlands**

Reference: Wetlands: Biological Assessment Methods and Criteria Development Workshop

Author(s) James R. Karr

Publisher US EPA

Volume number

Issue number

Page(s) 29

Multiple Entries? ☑

Date of publication 1996

Assessment method Benthic Index of Biotic Integrity (BIBI)

Notes Ten metric index of biologic integrity.

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed: biological integrity

Indicators of functions/values 10 metrics including:
taxa richness
EPT

Regions of application:

Wetland types

Examples of method application:

Strenths of method: Uses measureable attributes that have been tested & responds to a range of human influences.

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Some thoughts on using a landscape framework to address cumulative impacts on wetland food chain support**

Reference: Environmental Management

Author(s) Jeffrey M. Klopatek

Publisher Springer-Verlag New York Inc.

Volume number 12

Issue number 5

Page(s) 703-411

Multiple Entries? ☐

Date of publication 1988

Assessment method

Notes primary production may not be the best measure to evaluate food chain support
habitat variables appear to provide more information
develop a landscape-oriented approach to separate wetlands into ecological regions and landscape elements

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Spatial and temporal variability of the Index of Biotic Integrity in three Midwestern streams**

Reference: Transactions of the American Fisheries Society

Author(s)
James R. Karr
Philip R. Yant
Kurt D. Fausch
Isaac J. Schlosser

Publisher

Volume number 116

Issue number 1

Page(s) 1-11

Multiple Entries? ☐

Date of publication 1987

Assessment method Index of Biotic Integrity (IBI)

Notes

Goals of method

Uses of method

Status of use

Regions of testing Champaign-Urbana, Illinois
northeast Indiana

Wetlands types tested

Results of testing Show that IBI ranks sites similarly in 2 Illinois watersheds where conditions remained relatively stable during 3 years of sampling, and rankings among sites conform to prior assessments based on habitat and water quality.

Neither a species diversity index nor any of the individual metrics that constitute IBI performed as consistently as IBI.

Sampling should be conducted during early summer to reduce variation due to seasonal fish migration and fall recruitment of young-of-the-year fish.

In an Indiana watershed, IBI reflected known habitat and water quality perturbations, and detected little or no improvement in biotic integrity following implementation of conservation practices.

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed: biologic integrity

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Special Assessment Needs and Issues: The Regulator's Perspective**

Reference: Proceedings of the National Wetland Assessment Symposium, Portland, Maine, June 1985

Author(s) Scott Hausman

Publisher Jon A. Kusler and Patricia Riexinger (eds.)

Volume number

Issue number

Page(s) 124-125

Multiple Entries? ☐

Date of publication 1985

Assessment method

Notes criteria for a methodology (from a WIRAM person)

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

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☐ **Can be used as a guide for design?**

Title **Strengthening Public Interest Valuation: Section 10/404 Permit Program**

Reference: Proceedings of the National Wetland Assessment Symposium, Portland, Maine, June 1985

Author(s) Felix E. Smith

Publisher Jon A. Kusler and Patricia Riexinger (eds.)

Volume number

Issue number

Page(s) 132-137

Multiple Entries? ☐

Date of publication 1985

Assessment method

Notes policy for protecting aquatic ecosystems and setting national guidelines

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

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☐ **Can be used as a guide for design?**

Title **Structural approach for developing wetland biological criteria**

Reference: Wetlands: Biological Assessment Methods and Criteria Development Workshop

Author(s) M.C. Gernes
J. Helgen

Publisher

Volume number

Issue number

Page(s)

Multiple Entries? ☐

Date of publication

Assessment method Wetland Index of Biotic Integrity (WIBI)

Notes The Minnesota Pollution Control Agency recognizes the need to develop biological criteria to support its long term water quality strategy & the refinement and implementation of wetland water quality standards.

Goals of method

Uses of method

Status of use in development & testing

Regions of testing Minnesota

Wetlands types tested depressional wetlands

Results of testing The biological community was sampled in 32 minimally impaired wetlands to establish reference condition.
Several invertebrate metrics & an amphibian metric were proposed.
Sensitivity of the proposed metrics were tested in 20 wetlands known to be influenced by storm water discharge or by agricultural practices.
6 reference wetlands were sampled for comparison w/impaired wetlands to modify invertebrate metrics & to develop intial vegetation metrics.
The next step is to test a simplified approach suitable for nontechnical persons.

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

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☐ **Can be used as a guide for design?**

Title **Structure and composition of riparian forests with special reference to geomorphic site conditions along the Tokachi River, northern Japan**

Reference: Plant Ecology

Author(s) F. Nakamura
T. Yajima
S. Kikuchi

Publisher

Volume number 133

Issue number 2

Page(s) 209-219

Multiple Entries? ☐

Date of publication 1997

Assessment method

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

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Title **Study endorses EMAP environmental trends sampling method**

Reference: Environmental Science and Technology

Author(s) Alan Newman

Publisher

Volume number 29

Issue number 6

Page(s) 248A

Multiple Entries? ☐

Date of publication 1995

Assessment method EMAP

Notes

Goals of method

Uses of method

Status of use testing

Regions of testing

Wetlands types tested

Results of testing

Examined EMAP data gathered since 1991 from 350 northeastern lakes to compare EMAP's approach of sampling lakes on a 4-year cycle with annual visits to fewer lakes.

EMAP is significant;y better than annual visits at measuring the status of all the lakes, but slightly inferior to annual visits in picking up regional trends in measured parameters such as turbidity.

EMAP takes about 1 year longer than annual visits to identify trends, but it allows for sampling more sites than with annual visits with the same resources.

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

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Title **Success of riparian migration as compensation for impacts due to permits issued through Section 404 of the Clean Water Act in Orange**

Reference: Dissertation Abstracts International

Author(s) Mark F. Sudol

Publisher Dissertation Abstracts International

Volume number 57-11

Issue number section B

Page(s) 6833

Multiple Entries? ☐

Date of publication

Assessment method HGM

Notes assessed 70 compensatory mitigation sites by evaluating permit conditions and qualitative habitat and by using HGM

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Technical issues related to bioassessment of wetlands**

Reference: Wetlands: Biological Assessment Methods and Criteria Development Workshop

Author(s) J.R. Karr

Publisher US EPA

Volume number

Issue number

Page(s) 29

Multiple Entries? ☑

Date of publication 1996

Assessment method bioassessment

Notes Should metrics be combined into an overall index of biological integrity? Scientists should be careful when combining trophic levels & major families into a single metric. When families respond similarly to a stressor, combining them may be helpful for scientists. If they respond differently to the stressors, separating them into individual metrics may provide more helpful information than combining them into a single metric.

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed: biological integrity

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

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Publisher US EPA

Volume number

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Page(s) 29

Multiple Entries? ☑

Date of publication 1996

Assessment method bioassessment

Notes taxa selection:
1. Some taxa react more strongly to stressors & require fewer sampling resources
2. Program scole can influence taxa selection - taxa that spend their entire lives w/in or near the wetland can be used to assess a single wetland; mobile species can be used to assess integrity at a watershed or landscape scale (stressors outside of the wetland could contribute to the decline of birds & other mobile taxa)

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed: biological integrity

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

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Reference: Wetlands: Biological Assessment Methods and Criteria Development Workshop

Author(s) J.R. Karr

Publisher US EPA

Volume number

Issue number

Page(s) 29

Multiple Entries? ☑

Date of publication 1996

Assessment method bioassessment

Notes Diversity indices (e.g., Hilsenhoff Biotic Index) may not be appropriate for wetlands - cloud the data & hide important trends because the middle of the spectrum is overemphasized. Mulitmetric indices should be used - w/some metrics focusing on middle of the spectrum & others focusing on the most tolerant & sensitive species. Note: Many responses of assemblages to increaing habitat disturbance will not be linear.

Research is needed to develop bioassessment methods for "drier-end" (e.g., ephemeral) wetlands.

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed: biological integrity

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Technical issues related to bioassessment of wetlands**

Reference: Wetlands: Biological Assessment Methods and Criteria Development Workshop

Author(s) J.R. Karr

Publisher US EPA

Volume number

Issue number

Page(s) 29

Multiple Entries? ☑

Date of publication 1996

Assessment method bioassessment

Notes How many metrics should be included in an overall index of biotic integrity?
1. In general, more metrics are needed to assess wetlands w/rich biota than to assess wetlands w/fewer taxa.
2. Enough metrics should be included to represent each of the following (although metrics do not need to be distributed evenly between these areas) - species/taxa composition, species/taxa richness, ecological structre/process/function, & individual health
3. States should avoid making metrics too specific while selecting & calibrating metrics
4. States should avoid developing a new metric & sampling method for each wetland types (standard metrics can be calibrated to different wetland types by using reference wetlands of each type).

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed: biological integrity

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

Title **Technical issues related to bioassessment of wetlands**

- [ ] Can directly compare wetlands from different classes?
- [ ] Can be used as a guide for design?

Reference: Wetlands

Author(s) K. J. Havens

Publisher

Volume number 17

Issue number 2

Page(s) 237-242

Multiple Entries? [ ]

Date of publication 1997

Assessment method

Notes effect of rhyizosphere oxidation on redox level

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

- [ ] Can directly compare wetlands within the same class?
- [ ] Can directly compare wetlands from different classes?
- [ ] Can be used as a guide for design?

Title **The HGM Approach Explained**

Reference: National Wetlands Newsletter

Author(s) Mark Brinson

Publisher Environmental Law Institute

Volume number

Issue number Nov-Dec

Page(s) 7-13

Multiple Entries? ☐

Date of publication 1995

Assessment method Hydrogeomorphic approach (HGM)

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **The hydrogeomorphic approach as a basis for procedures of functional analysis of European wetland ecosystems**

Reference: National Interagency Workshop on Wetlands: Technology Advances for Wetlands Science, New Orleans, LA, April 1995

Author(s) E. Maltby
D. V. Hogan
R. J. McInnes

Publisher USACOE WES (http://www.wes.army.mil/EL/workshop/contents.html)

Volume number

Issue number

Page(s)

Multiple Entries? ☐

Date of publication 1995

Assessment method HGM

Notes limitations of hydrogeomorphic units (HGMUs)
Notes on back: see glacier.gg.rhbnc.ac.uk/CEDEMres.html
Wetlands Ecosystem Research Group (WERG)
-main part of CEDEM carries our pure and applied research
-"pioneered the functional approach to the investigation of wetlands and is responsible for the development of procedures for the Functional Assessment of European Wetland Ecoystems (FAEWE) for the European Commision." FAEWE and PROTOWET funded by EC.
-FAEWE focuses on river marginal wetlands in order to extablish important principles that can then be extended to other wetland ecosystems.
-PROTOWET extends the FAEWE project into different wetland types to embrace lake margin and estuarine wetlands as well as new marginal sites.

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Title **The hydrogeomorphic approach as a basis for procedures of functional analysis of European wetland ecosystems**

Examples of method application:

Strenths of method:

Limitations of method:

- [ ] Can directly compare wetlands within the same class?
- [ ] Can directly compare wetlands from different classes?
- [ ] Can be used as a guide for design?

Reference: Freshwater Biology

Author(s) F. R. Hauer
R. D. Smith

Publisher

Volume number 40

Issue number 3

Page(s) 517-530

Multiple Entries? ☐

Date of publication 1998

Assessment method HGM

Notes HGM use for mitigation

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

- [ ] Can directly compare wetlands within the same class?
- [ ] Can directly compare wetlands from different classes?
- [ ] Can be used as a guide for design?

Title **The hydrologic and biogeochemical functions of five east Texas bottomland hardwood wetlands using the United States Corps of Engineers**

Reference: Masters Abstracts International

Author(s) Jennifer S. Key

Publisher Masters Abstracts International

Volume number 36-01

Issue number

Page(s) 0113

Multiple Entries? ☐

Date of publication

Assessment method HGM

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **The Mid-Atlantic HGM Riverine Initiative: Where we are and where we hope to go**

Reference: Wetlands: Biological Assessment Methods and Criteria Development Workshop

Author(s) S.D. Eckles

Publisher US EPA

Volume number

Issue number

Page(s) 29

Multiple Entries? ☐

Date of publication 1996

Assessment method Hydrogeomorphic Approach (HGM)

Notes Mid-Atlantic HGM Riverine Wetlands Initiative is a regional effort involving developing models for one or more subclasses of riverine wetlands located on the Inner Coastal Plain of Delaware, Maryland, and Virginia.

Goals of method

Uses of method

Status of use in development

Regions of testing mid-Atlantic Inner Coastal Plain of Delaware, Maryland, and Virginia

Wetlands types tested riverine wetlands along small stream bottoms (orders 1-3)

Results of testing A-team was assembled and is using a draft guidebook for riverine wetlands along small stream bottoms (orders 1-3) located on the mid-Atlantic Inner Coastal Plain as a template to conduct tasks leading to finalization of a regional guidebook.

The final regional guidebook may include models for one or more subclasses of riverine wetlands on the mid-Atlantic Inner Coastal Plain.

While HGM is not developed to quantify or assess cumulative impacts, combining regional HGM efforts w/a study to address cumulative impacts w/in a portion of the mid-Atlantic region will eventually provide robust data sets for the conservation of wetlands.

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method: HGM is not developed to quantify or assess cumulative impacts.

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **The National Action Plan to Implement the Hydrogeomorphic Approach to Assessing Wetland Functions**

Reference: Federal Register

Author(s) Army Corps of Engineers

Publisher

Volume number 62

Issue number 119

Page(s) 33607-33 620

Multiple Entries? ☐

Date of publication June 20, 1997

Assessment method Hydrogeomorphic Approach (HGM)

Notes HGM is based of 3 fundamental factors that influence how wetlands function: position in the landscape (geomorphic setting), water source (hydrology), and the flow and fluctuation of the water once in the wetland (hydrodynamics).

Goal of National Action Plan: to implement, through regional guidebook development, sufficient assessment models to address 80% of section 404 permit workload requiring wetland function assessments.

Goals of method To measure the capacity of a wetland to perform certain functions while satisfying the need for better information on wetland functions within the programmatic requirements of the Clean Water Act Section 404 regulatory program.

Uses of method To rapidly & consistently assess the level of environmental impact of a proposed project.
To compare project alternatives.
To identify measures that would minimize environmental impacts of a proposed project.
To determine the appropriate level of regulatory review.
To assess compensatory mitigation required for offsetting environmental impacts.
To establish standards for measuring mitigation success.

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability: Courses have been proposed by the C

Proposed future revisions:

Applicable wetland types: riverine, depressional, slope, flats (mineral soil and organic soil), & fringe (estuarine and lacustrine)

Functions/values assessed:

Title **The National Action Plan to Implement the Hydrogeomorphic Approach to Assessing Wetland Functions**

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method: Will increase accuracy of wetland functional assessments, allow for replicability, and reduce time required to conduct a functional

Limitations of method: HGM does not assess wetland values.

An assessment using HGM is not a substitute for

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Reference: Proceedings of the National Wetland Assessment Symposium, Portland, Maine, June 1985

Author(s) Patricia J. Ruta Stuber

Publisher Jon A. Kusler and Patricia Riexinger (eds.)

Volume number

Issue number

Page(s) 151-153

Multiple Entries? ☐

Date of publication 1985

Assessment method

Notes Reference: discusses the annotated bibliography appearing in the title

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title The New Jersey computer program for the Wetland Functional Assessment Method: An Environmental Perspective

Reference: Proceedings of the National Wetland Assessment Symposium, Portland, Maine, June 1985

Author(s)

Publisher Jon A. Kusler and Patricia Riexinger (eds.)

Volume number

Issue number

Page(s)

Multiple Entries? ☐

Date of publication 1985

Assessment method Federal Highway Administration's Wetland Functional Assessment

Notes NJDOT & Office of Telecommunications and Information Services (OTIS) have computerized the FHA's method

Goals of method to rank wetlands according to their functions and evaluate their sensitivity to highway-related activities

Uses of method To help implement transportation-related environmental management practices.

To identify functions affected by strip takings (wetland impact areas).

To evaluate this impact in terms of functions within the broader basin in which the wetland is located.

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed: groundwater recharge and discharge
floodwater storage
shoreline anchoring and dissipation of erosive

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method: It consideres the seasonal and hydrologic variations of wetlands.

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **The occurrence and impact of sedimentation in central Pennsylvania wetlands**

Reference: Environmental Monitoring & Assessment

Author(s) D. H. Wardrop
R.P. Brooks

Publisher

Volume number 51

Issue number 1-2

Page(s) 119-130

Multiple Entries? ☐

Date of publication 1998

Assessment method

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **The Report of the Ecological Society of America Committee on the Scientific Basis for Ecosystem Management**

Reference: http://www.sdsc.edu/~ESA/ecmtext.htm

Author(s)

Publisher Ecological Society of America

Volume number

Issue number

Page(s) 7 pp.

Multiple Entries? ☐

Date of publication 1995?

Assessment method

Notes -Spatial and temporal scale are critical -- which scale is appropriate depends on the process being studied
-Management approaches should be considered a possible means of achieving the goals at hand, thus monitoring programs should provid critical and timely feedback to managers that the management hypothesis may be tested and revised as needed
-Management must be aware of the influences/impacts of decisions on surrounding areas
-management jurisdictions should be spatially congruent with the behavior of ecosystem processes and ecosystem management must find consensus among the stakeholders involved with each ecosystem
-scientists should be contributing to development of monitoring programs, especially by creating sampling approaches, statistical analyses, and scientific models
-monitoring programs require additional funds and can be difficult to maintain without permanent personnel
-the scientific community can maximize information return while minimizing costs to speed development and effectiveness of programs
-standards for obtaining data have been better developed in some areas (like hydrology and climate) than others (like biological diversity, where standards are nonexistent)
-the public must be educated! Limited public understanding of scientific methods and issues makes management more challenging
-stakeholders must be in consensus. May identify them by matching ownership maps with ecosystem

Goals of method

boundaries (e.g., a watershed)

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

- [ ] Can directly compare wetlands within the same class?
- [ ] Can directly compare wetlands from different classes?
- [ ] Can be used as a guide for design?

Title **The role of reference wetlands in functional assessment and mitigation**

Reference: Ecological Applications

Author(s) M. M. Brinson
R. Rheinhardt

Publisher

Volume number 6

Issue number 1

Page(s) 69-76

Multiple Entries? ☐

Date of publication 1996

Assessment method

Notes Describes a means for stanardizing analyses of compensatory mitigation damages such that the wetland functions being displaced will actually be replaced by the mitigation project.

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **The use of FHWA's Wetland Functional Assessment methodology in New Jersey**

Reference: Proceedings of the National Wetland Assessment Symposium, Portland, Maine, June 1985

Author(s) David L. Poling
Eugene T. McColligan, Jr.

Publisher Jon A. Kusler and Patricia Riexinger (eds.)

Volume number

Issue number

Page(s)

Multiple Entries? ☐

Date of publication 1985

Assessment method Federal Highway Administration's Wetland Functional Assessment

Notes Describes the FHWA's method use in NJ

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application: New Jersey:
NJ DOT has been one of the most frequent
[illegible]

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **The use of remote sensing and GIS in the assessment of visual attributes: Case study of the northwestern coastal zone of Egypt**

Reference: Proceedings of the Seventeenth Annual ESRI User Conference

Author(s) Yassr Ayad
Michel Guenet

Publisher ESRI

Volume number

Issue number

Page(s)

Multiple Entries? ☐

Date of publication 1997

Assessment method Remote sensing/GIS

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **The Wisconsin DNR Rapid Assessment Methodology: A Simple Qualitative Approach for Assessing Wetland Functional Values**

Reference: http://www.wes.army.mil/el/workshop/FA2-4.html

Author(s) David R. Siebert

Publisher

Volume number

Issue number

Page(s)

Multiple Entries? ☐

Date of publication

Assessment method Wisconsin Rapid Assessment Methodology (WI RAM)

Notes

Goals of method To qualitatively evaluate wetland functions and values, & to make decisions about the significance of wetland impacts.
To develop a simple, time-efficient methodology that is defensible (legally & scientifically) and can be completed with limited site visits.

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed: special features (e.g., state parks, wild and scenic rivers)
floral diversity

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method: Recognizes that not all wetlands perform all functions.

Limitations of method: Based on best professional judgement.

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Training Users of the Adamus System: The Federal Highway Administration Experience**

Reference: Proceedings of the National Wetland Assessment Symposium, Portland, Maine, June 1985

Author(s) Charles DesJardins

Publisher Jon A. Kusler and Patricia Rieximnger, eds.

Volume number

Issue number

Page(s) 84-85

Multiple Entries? ☐

Date of publication 1985

Assessment method Adamus System

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Transposing Wetlands Charactersitics to Wetland Values: The 404 (b)(1) Analysis**

Reference: Proceedings of the National Wetland Assessment Symposium, Portland, Maine, June 1985

Author(s) Dale Hall

Publisher Jon A. Kusler and Patricia Riexinger (eds.)

Volume number

Issue number

Page(s) 128-131

Multiple Entries? ☐

Date of publication 1985

Assessment method

Notes Discusses various wetland functions and 404 (b)(1)

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Trebds and patterns in Section 404 permitting requiring compensatory mitigation in Oregon and Washington, USA**

Reference: Environmental Management

Author(s)
M. E. Kentula
J. C. Sifneos
J. W. Good
M. Rylko
K. Kunz

Publisher

Volume number 16

Issue number 1

Page(s) 109-119

Multiple Entries? ☐

Date of publication 1992

Assessment method

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **U.S. Geological Survey Data Sources for Wetland Assessment**

Reference: Proceedings of the National Wetland Assessment Symposium, Portland, Maine, June 1985

Author(s) Virginia Carter
Franklin S. Baxter

Publisher Jon A. Kusler and Patricia Riexinger (eds.)

Volume number

Issue number

Page(s) 140-145

Multiple Entries? ☐

Date of publication 1985

Assessment method

Notes Reference: lists data sources available for assessment purposes from various agencies/data centers

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Uses and Proposed Revisions for the Adamus Assessment Methodology**

Reference: Proceedings of the National Wetland Assessment Symposium, Portland, Maine, June 1985

Author(s) Paul Adamus

Publisher Jon A. Kusler and Patricia Rieximnger, eds.

Volume number

Issue number

Page(s) 73-77

Multiple Entries? ☐

Date of publication 1985

Assessment method A Method for Wetland Functional Assessment

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Using bioindicators to develop an Index of Ecological Integrity for forested headwater ecosystems**

Reference: http://www.research.psu.edu/erri/publications/brook198.html

Author(s)

Publisher

Volume number

Issue number

Page(s)

Multiple Entries? ☐

Date of publication

Assessment method Index of Ecological Integrity

Notes Headwaters are important to the ecological integrity, recreational quality, and food production of riparian ecosystems.

Goals of method To identify thresholds of environmental disturbance related to multiple stressors in Mid-Atlantic headwater forests.

Uses of method To document trends, prioritize issues, and target protection and restoration efforts in forested headwater ecosystems.

Status of use in development

Regions of testing Pocono Mountains, PA
central PA

Wetlands types tested

Results of testing Will explore the following bioindicators:
- avian productivity (primarily for Louisiana waterthrush)
- macroinvertebrate communities
- avain communities

The Louisianna waterthrush is an excellent indicator of healthy forested riparian ecosystems in the eastern US. Macroinvertebrate and avian communities are established as useful predictors of instream conditions and landscape pattern, respectively.

How enviromental stressors affect the presence, abundance, and productivity of bird and macroinvertebrate populations at multiple spatial and temporal scales will be determined as well as the relationship between the bioindicators and habitat condition to create an index of regional riparian ecosystem integrity in the Mid-Atlantic region.

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Using tidal salt marsh mesocosms to aid wetland restoration**

Reference: Restoration Ecology

Author(s) John C. Callaway
Joy B. Zedler
Donna L. Ross

Publisher

Volume number 5

Issue number 2

Page(s) 135-146

Multiple Entries? ☐

Date of publication 1997

Assessment method

Notes Mesocosms can be useful models for designing and testing restoration techniques prior to field implementation and should be used to develop new methods for monitoring wetland ecosystems.

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Variable fish communities and the Index of Biotic Integrity in a Western Great Plains river**

Reference: Transactions of the American Fisheries Society

Author(s) Robert G. Bramblett
Kurt D. Fausch

Publisher

Volume number 120

Issue number

Page(s) 752-769

Multiple Entries? ☐

Date of publication 1991

Assessment method Index of Biotic Integrity (IBI)

Notes

Goals of method

Uses of method

Status of use

Regions of testing Purgatoire River, Colorado

Wetlands types tested

Results of testing Attempt to modify IBI to assess impacts of US Army mechanized infantry training activities on a relatively undisturbed reach of a western Great Plains river.

Variation in relative abundance of one fish species caused large increases in the IBI despite the lack obvious environmental changes.

The understanding of the structure, function, and natural variation of fish communities in western Great Plains streams must increase substantially before appropriate measures of biotic integrity can be defined.

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed: species richness and composition
trophic composition
fish abundance and condition

Indicators of functions/values species richness and composition
- total # of fish species

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Vegetation and ecological conditions of the Pheasant Branch and Belfontaine Conservances: Opportunities for restoration and management**

Reference: http://www.pheasantbranch.org/html/larson.htm

Author(s) John L. Larson
Susan M. Lehnhardt
Reed Cockrell

Publisher

Volume number

Issue number

Page(s)

Multiple Entries? ☐

Date of publication 1998

Assessment method Wisconsin Rapid Assessment Methodology (WI RAM)

Notes This is a report that summarizes results from natural resource inventories conducted to understand existing ecological conditions and opportunities for ecological restoration and management in the Pheasant Branch and Belfontain Conservancies located in Middleton, WI.

WI RAM was used to determine the health of these systems and assess wetland functions.

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application: Pheasant Branch and Belfontain Conservancies in Middleton, WI

Wetland types sedge meadow
sedge meadow/shrub carr

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Vital landscape attributes: Missing tools for restoration ecology**

Reference: Restoratino Ecology

Author(s) James Aronson
Edouard Le Floc'h

Publisher

Volume number 4

Issue number 4

Page(s) 377-387

Multiple Entries? ☐

Date of publication 1996

Assessment method

Notes outlines 16 vital landscape attributes to consider when quantifying whole ecosystem structure, compostiion, and functional complexity over time

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Waterbirds and substrate quality of the Pichavaram Wetlands, southern India**

Reference: Ibis

Author(s) R. Nagarajan
K. Thiyagesan

Publisher

Volume number 138

Issue number 4

Page(s) 710-721

Multiple Entries? ☐

Date of publication 1996

Assessment method

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Watershed functions**

Reference: Water Resources Bulletin

Author(s) P. E. Black

Publisher

Volume number 33

Issue number 1

Page(s) 1-11

Multiple Entries? ☐

Date of publication 1997

Assessment method

Notes hydrological and ecological functions

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **WET: A wetland evaluation technique for microcomputers**

Reference: Proceedings of the National Wetland Assessment Symposium, Portland, Maine, June 1985

Author(s) Ellis J. Clairain, Jr.

Publisher Jon A. Kusler and Patricia Riexinger (eds.)

Volume number

Issue number

Page(s)

Multiple Entries? ☐

Date of publication 1985

Assessment method Wetland Evaluation Technique (WET)

Notes Army Corps of Engineers created WET by computerizing the FHWA's method and improving on gaps in information regarding the functions (especially hydrology).

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **WET: A wetland evaluation technique for southeastern coastal plain wetlands**

Reference: Proceedings of the National Wetland Assessment Symposium, Portland, Maine, June 1985

Author(s) Brian H. Winchester

Publisher Jon A. Kusler and Patricia Riexinger (eds.)

Volume number

Issue number

Page(s)

Multiple Entries? ☐

Date of publication 1985

Assessment method WET: A wetland evaluation technique for southeastern coastal plains

Notes

Goals of method To numerically rank wetlands according to value.
To evaluate major functions of different types of wetlands
To be time and cost effective.
To minimize subjectivity.
To be flexible so that it can be refined with new scientific advances.

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed: water quality enhancement
water detention
productivity and diversity

Indicators of functions/values wetland size
wetland contiguity

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Wetland and aquatic macrophytes as indicators of anthropogenic hydrologic disturbance**

Reference: Natural Areas Journal

Author(s) D. A. Wilcox

Publisher

Volume number 15

Issue number 3

Page(s) 240-248

Multiple Entries? ☐

Date of publication 1995

Assessment method

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Wetland Bioassessment Projects**

Reference: Wetland Bioassessment Fact Sheet (EPA843-F-98-001)

Author(s) Thomas J. Danielson

Publisher US EPA

Volume number

Issue number

Page(s)

Multiple Entries? ☐

Date of publication 1998

Assessment method bioassessment

Notes see photocopy for a table of bioassessment projects (including project purpose, species assemblages, wetland type, etc.)

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Wetland Biological Assessment & HGM Functional Assessment**

Reference: Wetland Bioassessment Fact Sheets (EPA843-F-98-001)

Author(s) Thomas J. Danielson
Mark Brinson

Publisher US EPA

Volume number

Issue number

Page(s) 7

Multiple Entries? ☑

Date of publication 1998

Assessment method Index of Biological Integrity (IBI)

Notes

Goals of method To evaluate a wetland's abity to support and maintain a balanced, adaptive community of organisms having a species composition, diversity, & functional organization comparable w/that of minimally disturbed wetlands w/in a region.

Uses of method To establish wetland biological criteria for state water quality standards
To determine if wetlands meet water quality standards.
To evaluate restoration success.
To administrate CWA 401 water quality certification.
To track wetland condition for CWA 305 water quality reports.

Status of use applied.

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed: biologic integrity

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method: Can show if a wetland is degraded by any chemical, physical, or biological stressors & help scientists diagnose the stressor(s)

Limitations of method: Requires the development or refinement of regionally appropriate assessment methods.

☑ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Wetland Biological Assessment & HGM Functional Assessment**

Reference: Wetland Bioassessment Fact Sheets (EPA843-F-98-001)

Author(s) Thomas J. Danielson
Mark Brinson

Publisher US EPA

Volume number

Issue number

Page(s) 7

Multiple Entries? ☑

Date of publication 1998

Assessment method Hydrogeomorphic Approach (HGM)

Notes

Goals of method To evaluate current wetland functions & predict potential changes to a wetland's functions that may result from proposed activities, by comparing a wetland to similar, relatively unaltered wetlands.

Uses of method To evaluate project impacts & compare project alternatives (including CWA 404 permitting and Swampbuster provision of Food Security Act)
To evaluate restoration projects by estimating changes in functioning over time.

Status of use applied.

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed: hydrology
biogeochemical
physical habitat

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method: HGM has direct applications for CWA 404 decisions.

Limitations of method: Requires the development or refinement of regionally appropriate assessment methods.

☑ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Wetland denitrification - Influence of site quality and relationships with wetland delineation protocols**

Reference: Soil Science Society of America Journal

Author(s) P. M. Groffman
G. C. Hanson

Publisher

Volume number 61

Issue number 1

Page(s) 323-329

Multiple Entries? ☐

Date of publication 1997

Assessment method

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Wetland Functions and Values: A Descriptive Approach**

Reference: http://www.wes.army.mil/el/workshop/FA2-2.html

Author(s) Theresa A. Flieger
Robert DeSanto

Publisher

Volume number

Issue number

Page(s)

Multiple Entries? ☐

Date of publication

Assessment method Wetland Functions and Values: A Descriptive Approach

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements: 1-2 hours per site

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values

Regions of application: New England

Wetland types

Examples of method application: Has been used by the New England Division of the COE on numerous projects for several years with

Strenths of method: Flexiblity in terms of documented rationale to predict the occurrence of various functions.

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Wetland Functions and Values: A Descriptive Approach (Descriptive Approach)**

Reference: Wetland

Author(s) Eric D. Stein
Richard F. Ambrose

Publisher

Volume number 18

Issue number 3

Page(s) 379-392

Multiple Entries? ☑

Date of publication 1998

Assessment method Wetland Replacemnt Evalaution Procedure (WREP)

Notes a modification of WET

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed: shoreline erosion control
sediment stabilization
water quality

Indicators of functions/values biological and physical attributes

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Wetland Functions and Values: A Descriptive Approach (Descriptive Approach)**

Reference: Wetland

Author(s) Eric D. Stein
Richard F. Ambrose

Publisher

Volume number 18

Issue number 3

Page(s) 379-392

Multiple Entries? ☑

Date of publication 1998

Assessment method Wetland Functions and Values: A Descriptive Approach (Descriptive Approach)

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values spatial diversity and interspersion
# of strata (structural diversity)

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Wetland Functions and Values: A Descriptive Approach (Descriptive Approach)**

Reference: Wetland

Author(s) Eric D. Stein
Richard F. Ambrose

Publisher

Volume number 18

Issue number 3

Page(s) 379-392

Multiple Entries? ☑

Date of publication 1998

Assessment method Methodology for Biological Monitoring of Cumulative Impacts on Watersheds

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values ratio of disturbed to undisturbed area

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Wetland Functions and Values: A Descriptive Approach (Descriptive Approach)**

Reference: Wetland

Author(s) Eric D. Stein
Richard F. Ambrose

Publisher

Volume number 18

Issue number 3

Page(s) 379-392

Multiple Entries? ☑

Date of publication 1998

Assessment method Minnesota Wetland Evaluation Methodology (WEM)

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed: floodflow alteration
water-quality enhancement
wildlife habitat

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Wetland Functions and Values: A Descriptive Approach (Descriptive Approach)**

Reference: Wetland

Author(s) Eric D. Stein
Richard F. Ambrose

Publisher

Volume number 18

Issue number 3

Page(s) 379-392

Multiple Entries? ☑

Date of publication 1998

Assessment method New Hampshire Method (NH Method)

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed: 14 functions

Indicators of functions/values physical characteristics of the wetland are used to evaluate 14 function similar to WET

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Wetland Functions and Values: A Descriptive Approach (Descriptive Approach)**

Reference: Wetland

Author(s) Eric D. Stein
Richard F. Ambrose

Publisher

Volume number 18

Issue number 3

Page(s) 379-392

Multiple Entries? ☑

Date of publication 1998

Assessment method Synoptic Approach to Cumulative Impact Assessment (Synoptic Approach)

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values set of synoptic idices based on the specific location and management goal measured & mapped using

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Wetland Functions and Values: A Descriptive Approach (Descriptive Approach)**

Reference: Wetland

Author(s) Eric D. Stein
Richard F. Ambrose

Publisher

Volume number 18

Issue number 3

Page(s) 379-392

Multiple Entries? ☑

Date of publication 1998

Assessment method Wetland Evaluation Technique (WET)

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed: 11 functions (e.g., ground water recharge, flood storage, dissipation of erosive forces, nutrient retention, habitat for fisheries, habitat for

Indicators of functions/values biological and physical attributes (e.g., water-flow patterns, salinity,

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Wetland Functions and Values: A Descriptive Approach (NEDEP-360-1-30a)**

Reference: The Highway Methodology Workbook: Supplement

Author(s) USACOE

Publisher USACOE

Volume number

Issue number

Page(s)

Multiple Entries? ☑

Date of publication 1995

Assessment method Wetland Evaluation Technique (WET II)

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method: WET II is not accepted by the COE. It is not regionally sensitive and does not consider and does not consider wildlife habitat corresponding to the

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Wetland Functions and Values: A Descriptive Approach (NEDEP-360-1-30a)**

Reference:	The Highway Methodology Workbook: Supplement
Author(s)	USACOE
Publisher	USACOE
Volume number	
Issue number	
Page(s)	
Multiple Entries?	☑
Date of publication	1995
Assessment method	Wetland Functions and Values: A Descriptive Approach
Notes	
Goals of method	
Uses of method	
Status of use	
Regions of testing	
Wetlands types tested	
Results of testing	
Personnel requirements:	
Time requirements:	
Training availability:	
Proposed future revisions:	
Applicable wetland types:	n/a
Functions/values assessed:	groundwater recharge/discarge floodflow alteration fish and shellfish habitat
Indicators of functions/values	see photocopy
Regions of application:	
Wetland types	
Examples of method application:	
Strenths of method:	
Limitations of method:	

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Wetland hydrological vulnerability and the use of classification procedures - A Scottish case study**

Reference:	Journal of Environmental Management
Author(s)	D. J. Gilvear R. J. McInnes
Publisher	
Volume number	42
Issue number	4
Page(s)	403-414
Multiple Entries?	☐
Date of publication	1994
Assessment method	
Notes	hydrological classification of wetlands
Goals of method	
Uses of method	
Status of use	
Regions of testing	
Wetlands types tested	
Results of testing	
Personnel requirements:	
Time requirements:	
Training availability:	
Proposed future revisions:	
Applicable wetland types:	
Functions/values assessed:	
Indicators of functions/values	
Regions of application:	
Wetland types	
Examples of method application:	
Strenths of method:	
Limitations of method:	

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Wetland insect populations as biological indicators: evaluation of a wetland mitigation monitoring tool**

Reference:

Author(s) Ralph J. Garono
Richard L. Kiesling
George M. Staff

Publisher

Volume number

Issue number

Page(s)

Multiple Entries? ☐

Date of publication

Assessment method bioassessment

Notes

Goals of method

Uses of method

Status of use in development

Regions of testing Ohio
Texas

Wetlands types tested

Results of testing Caddisflies are highly dependant on environmental conditions associated with wetland habitats and may act as integrative measures of wetland state and mitigation success.

The capture and identification of caddisflies may prove to be an inexpensive, non-intrusive method of assessing wetland function.

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Wetland loss and substitution by the Section 404 permit program in southern California, USA**

Reference: Environmental Management

Author(s) Allen, A. O.
Feddema, J. J.

Publisher

Volume number 20

Issue number 2

Page(s) 263-274

Multiple Entries? ☐

Date of publication 1996

Assessment method

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Wetland monitoring & development of wet meadow biocriteria for the Platte River in central Nebraska**

Reference: Wetlands: Biological Assessment Methods and Criteria Development Workshop

Author(s) P. Currier

Publisher US EPA

Volume number

Issue number

Page(s) 29

Multiple Entries? ☐

Date of publication 1996

Assessment method bioassessment

Notes A conceptual floodplain model was developed to integrate effects of river and land management on river channel, wet meadow, backwater, & riparian habitats, as well as on key species, including cranes, wetland vegetation, amphibians, & nesting grassland and woodland birds.

Goals of method

Uses of method

Status of use in development

Regions of testing Platte River, Nebraska

Wetlands types tested

Results of testing To evaluate the ecological links in the floodplain model, preliminary biocriteria that include hydrologic monitoring, avian habitat use, wetland plant indicators, & distribution and abundance of aquatic organisms.

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Wetland Rapid Assessment Procedure (WRAP)**

Reference: South Florida Water Management District Technical Publication REG-001

Author(s) Miller, Raymond E., Jr.
Gunsalus, Boyd E.

Publisher

Volume number n/a

Issue number n/a

Page(s) 36

Multiple Entries? ☐

Date of publication September, 1997 (rev. April 1999)

Assessment method Wetland Rapid Assessment Procedure (WRAP)

Notes

Goals of method measure of quality of specific wetlands functions and values

Uses of method to establish an accurate, consistent, and timely regulatory tool; to track trends over time (i.e. land use vs. wetland impacts); and to offer guidance for environmental site plan development

Status of use tested

Regions of testing West Palm Beach, FL
Orlando. FL

Wetlands types tested wet prarie, emergent marsh, cypress swamp, mixed

Results of testing

Personnel requirements:

Time requirements: method designed to be completed within a limited time frame

Training availability:

Proposed future revisions:

Applicable wetland types: wide range of wetland/upland systems

Functions/values assessed: wildlife utilization
wetland overstory/shrub canopy
wetland vegetative ground cover

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Wetlands - Conservation Plan**

Reference: http://dcm2.enr.state.nc.us/Wetlands/conserve.htm

Author(s)

Publisher North Carolina Department of Environment and Natural Resources, Division of Coastal Management

Volume number

Issue number

Page(s)

Multiple Entries? ☐

Date of publication 6/14/01, accessed 1/23/02

Assessment method

Notes about the North Caroline 1992 Wetlands Conservation Plan
-components: a wetlands inventory, functional assessment, wetland restoration, agency coordination, coastal area wetland policies, and local land-use planning
-inventory completed using GIS-based wetlands mapping program
-functional assesment examines ecological significance of each wetland using a GIS-based landscape analysis of each wetland and evaluating water quality, hydrology, wildlife habitat, and the risk to the watershed should a wetland be removed
-the first two components will be used to aid implementation of the remaining components and attempt to avoid destruction of the most ecologically important wetlands when planning development projects

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

Title **Wetlands - Conservation Plan**

- [ ] Can directly compare wetlands within the same class?
- [ ] Can directly compare wetlands from different classes?
- [ ] Can be used as a guide for design?

Reference: Proceedings of the National Wetland Assessment Symposium

Author(s) Craig Potter

Publisher

Volume number

Issue number

Page(s)

Multiple Entries? [ ]

Date of publication 1985

Assessment method Federal Highway Administration's Wetland Functional Assessment

Notes The Highway methodology has been revised into WET.

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application: Interior used the FHWA methodology to rank a portion of their wetland acquisitions for 1987.

Strenths of method: Recongnizes that all wetlands don't perform all functions and that some functions enhance each other, while others are incompatible.

Limitations of method:

- [ ] Can directly compare wetlands within the same class?
- [ ] Can directly compare wetlands from different classes?
- [ ] Can be used as a guide for design?

Title **Wetlands index of biotic integrity: Development of invertebrate and vegetation-based indices in degraded and reference wetlands**

Reference: Wetlands: Biological Assessment Methods and Criteria Development Workshop

Author(s) J. Helgen
M.C. Gerns

Publisher US EPA

Volume number

Issue number

Page(s) 29

Multiple Entries? ☐

Date of publication 1996

Assessment method Wetlands Index of Biotic Integrity (WIBI)

Notes

Goals of method biological metrics for multi-metric indices of wetland water quality

Uses of method

Status of use in development & testing

Regions of testing

Wetlands types tested

Results of testing

Reference Wetlands Project (MN LCMR & US EPA)
- showed that invertebrate richness was sensitive to water quality pararmeters
- developed several invertebrate metrics & 1 metric of successful amphibian reproduction

Wetlands Assessment Project (US EPA)
- tested whether the invertebrate metrics could detect impairment of stormwater & agriculture-influenced wetlands in relation to reference sites

8 metrics from vegetation are proposed.
Combining both invertebrate & vegetation WIBI scores provided sharpest separation of reference & impaired sites. However, having both WIBI multimetric approaches availbable will allow a wider seasonal index period for wetland assesment.

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types: n/a

Functions/values assessed: water quality
- invertebrate metrics (several)
- amphibian metric (1)

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method: Having both invertebrate & vegetative multimetric approaches availbable will allow a wider seasonal index period for wetland

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Wetlands of the interior southeastern United States - Conference summary statement**

Reference: Water, Air, & Soil Pollution

Author(s)
C. C. Trettin
W. M. Aust
M. M. Davis
A.S. Weakley
J. Wisniewski

Publisher

Volume number 77

Issue number 3-4

Page(s) 199-205

Multiple Entries? ☐

Date of publication 1994

Assessment method

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Title **Wetlands Training in the Corps of Engineers**

Reference: Proceedings of the National Wetland Assessment Symposium, Portland, Maine, June 1985

Author(s) Hanley K. Smith
Charles J. Newling

Publisher Jon A. Kusler and Patricia Riexinger (eds.)

Volume number

Issue number

Page(s) 86

Multiple Entries? ☐

Date of publication 1985

Assessment method

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Wetlands Values Assessment: A Federal Perspective**

Reference: Proceedings of the National Wetland Assessment Symposium, Portland, Maine, June 1985

Author(s) Janet O'Neill

Publisher Jon A. Kusler and Patricia Riexinger (eds.)

Volume number

Issue number

Page(s) 126-127

Multiple Entries? ☑

Date of publication 1985

Assessment method Habitat Suitability Index (HIS)

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Wetlands Values Assessment: A Federal Perspective**

Reference: Proceedings of the National Wetland Assessment Symposium, Portland, Maine, June 1985

Author(s) Janet O'Neill

Publisher Jon A. Kusler and Patricia Riexinger (eds.)

Volume number

Issue number

Page(s) 126-127

Multiple Entries? ☑

Date of publication 1985

Assessment method Adamus / Federal Highway Administration (Adamus and Stockwell 1983)

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Wetlands Values Assessment: A Federal Perspective**

Reference: Proceedings of the National Wetland Assessment Symposium, Portland, Maine, June 1985

Author(s) Janet O'Neill

Publisher Jon A. Kusler and Patricia Riexinger (eds.)

Volume number

Issue number

Page(s) 126-127

Multiple Entries? ☑

Date of publication 1985

Assessment method Habitat Evaluation Procedure (HEP)

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Reference: Society of Wetlands Scientists 20th Annual Meeting, Norfolk, Virginia, June 1999

Author(s)

Publisher Society of Wetland Scientists

Volume number

Issue number

Page(s)

Multiple Entries? ☐

Date of publication 1999

Assessment method

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **WETWorks Product Description**

Reference:				Author(s)			
Publisher	Two Ocean Software	Volume number		Issue number		Page(s)	9 pp.
Multiple Entries?	☐	Date of publication					
Assessment method		Notes	software	Goals of method			
Uses of method		Status of use		Regions of testing			
Wetlands types tested		Results of testing					
Personnel requirements:		Time requirements:		Training availability:			
Proposed future revisions:		Applicable wetland types:		Functions/values assessed:			
Indicators of functions/values		Regions of application:		Wetland types			
Examples of method application:		Strenths of method:		Limitations of method:			

☐ Can directly compare wetlands within the same class?

☐ Can directly compare wetlands from different classes?

☐ Can be used as a guide for design?

Title **Workshop Recommendations**

Reference: Ecological Resource Monitoring: Change and Trend Detection, 1-3 May 1996 in Laurel, Maryland

Author(s)

Publisher The Sustainable Biosphere Initiative (a project of the Ecological Society of America)

Volume number

Issue number

Page(s) 3 pp.

Multiple Entries? ☐

Date of publication 1996

Assessment method Environmental Monitoring and Assessment Program (EMAP)

Notes

Goals of method

Uses of method

Status of use

Regions of testing

Wetlands types tested

Results of testing

Personnel requirements:

Time requirements:

Training availability:

Proposed future revisions:

Applicable wetland types:

Functions/values assessed:

Indicators of functions/values

Regions of application:

Wetland types

Examples of method application:

Strenths of method:

Limitations of method:

☐ **Can directly compare wetlands within the same class?**

☐ **Can directly compare wetlands from different classes?**

☐ **Can be used as a guide for design?**

Appendix B

Additional Wetland Functional Assessments Critically Reviewed

Appendix B: The 20 wetland assessment methods that were considered appropriate for the study area, and had sufficient documentation to consider further for usefulness, comparability and efficiency of application.

<u>Methods Implemented:</u>
Wetland Rapid Assessment Procedure (WRAP - Florida)
Technique for Functional Assessment of Nontidal Wetlands in the Coastal Plain of Virginia (VIMS)
Wetland Functions and Value – A Descriptive Approach
Wisconsin Rapid Assessment Method (WI RAM)
Wetland Evaluation Technique (WET)
Guidance for Rating the Values of Wetlands in North Carolina (NC Guidance)
Maryland Department of Environment – Method for the Assessment of Wetland Function (MDE Method)
Wetland Mitigation Quality Assessment (WMQA)

<u>Other Methods Evaluated in Detail</u>:
Landscape Framework for Assessing Cumulative Impacts to Food Chains
GIS-based Landscape Scale Functional Assessment Procedure
Environmental Monitoring and Assessment Program for Wetlands (EMAP – Wetlands)
Watershed-based Wetland Assessment Method for the New Jersey Pinelands (NJ Watershed Method)
Method for Assessing Wetland Characteristics and Values
Model for the Assessment of Visual/Cultural Values of Wetlands (Visual/Cultural Assessment)
Index of Biotic Integrity (IBI - for streams)
Habitat Evaluation Procedure (HEP - Pennsylvania)
Wildlife Habitat Assessment and Management System (WHAMS)
Indicators of Hydrologic Alteration (IHA)
Wetland Index Biotic Integrity (WIBI - Minnesota)
New England Fresh Water Invertebrate Biomonitoring Protocol (NEFWIBP)

Below is a brief description of each of the wetland assessment methods that were initially evaluated in detail but were not implemented in this study.

Landscape Framework for Assessing Cumulative Impacts to Food Chains

The Landscape Framework for Assessing Cumulative Impacts to Food Chains proposes models to predict the impacts to wetland food chain support. Food chain support is defined as the biomass that is available for consumption at a wetland or that is available for transportation from the wetland. The method identifies four habitat and food support attributes of wetlands to be measured in order to evaluate potential impacts: patch (wetland) size, shape/edge, connectivity and conductivity, and spatial relationship or distance between wetlands. Habitat suitability index (HSI) models have been developed for many wetland vertebrates to determine whether a habitat can provide adequate support. These models can be used as static predictors of a wetland's food chain support. Interaction-redistribution models provide information on the location of animal populations relative to food resource distributions. The food chain support curve from the HSI model can be used in conjunction with spatial location models to evaluate impacts to food chains by determining the potential movements of species to adjacent wetlands due to changes in their current resource base (Klopatek 1988).

GIS-based Landscape Scale Wetland Functional Assessment Procedure

The North Carolina Division of Coastal Management developed a GIS-based wetland functional assessment procedure as a component in their Wetlands Conservation Plan for the North Carolina Coastal Area. This assessment assists regulatory agencies in determining the importance of protecting a particular wetland by evaluating a wetland's relative ecological significance within a watershed (NC Division of Coastal Management 2001). Three wetland functions: water quality, hydrology, and wildlife habitat, are evaluated based on parameters such as wetland type, size, soil characteristics, landscape position, water source, land use, and landscape patterns. The wetland's contribution to the overall quality of the watershed is also determined. The landscape-scale of this method allows for the assessment of wetlands over larger geographic regions (Wuenscher and Sutter 1995).

Environmental Monitoring and Assessment Program for Wetlands (EMAP-Wetlands)

The goal US Environmental Protection Agency's EMAP-Wetlands program is to assess the current condition and long-term trends of the status of wetland resources at both regional and national levels (Novitzki 1995). There are four steps in achieving that goal: to identify indicators of wetland condition for each wetland class in a region, to develop a framework for comparing a wetland's status with the status of reference wetlands in its region, to monitor the status of regional wetland populations, and to develop procedures to annually report program results. There are four main wetland functions identified by EMAP-Wetlands: biological integrity, productivity, hydrologic function, and water quality improvement (Novitzki 1994). The scope of EMAP was scaled back due to a lack of funds, poor understanding of the relationship between indicators and the effect of stressors on the environment, and difficulty in determining the appropriate scale of monitoring. The program has changed its focus to researching what should be monitored, why, and at what frequency (Newman 1995).

Watershed-based Wetland Assessment Method for the New Jersey Pinelands (NJ Watershed Method)

The New Jersey Watershed Method utilizes GIS and watershed-level landscape variables to assess the ecological integrity and potential impacts to wetland systems. It was developed by the Pinelands Commission to provide a relative comparison of all Pinelands watersheds and associated wetlands. Four landscape variables determine the watershed integrity score (WIS): land use (LUS), water quality (WQS), ground water withdrawal (GWS), and biodiversity (BDS). Each variable score is determined from digitized data sources and entered into the following equation to calculate the primary watershed integrity score (WIS°):

$$WIS° = 0.70\ (LUS) + 0.20\ (WQS) + 0.10\ (GWS) + 0.25\ (BDS)$$

The potential impact score (PIS) is evaluated using three variables: future land use pattern (LPS), transitional soils (TSS), and the basin and wetland dimension (WDS). These variables are entered into the following equation to calculate the primary potential impact score (PIS°):

$$PIS° = LPS + 0.01\ (LPS)(TSS) + 0.01\ (LPS)(WDS)$$

The WIS and PIS can be transformed into a range of wetland buffer distances that can help guide regulatory decisions. The NJ Watershed Method has been developed to rank and compare drainages at the landscape-level and is not applicable for small, site-specific projects. The availability of data sources required for the evaluation of landscape variables influences preparation time, and the evaluation may take months of office work by a team of experts. Although future revisions are not planned, the method's author recommends revisions before implementation (Bartoldus 1999).

Method for Assessing Wetland Characteristics and Values

The Method for Assessing Wetland Characteristics and Values was developed to provide policy-makers with rapid, preliminary information on inland wetland values based on available data and few sources. The method is based on the concept that a wetland's physical characteristics and functional attributes change predictably in relation to its position in the landscape. Each wetland is classified based on its landscape position: valley, hillside, or hilltop, and the relative importance of a wetland to provide each of three functions is evaluated: surface water protection, flood control, and wildlife value. Surface water protection is a rating of High, Medium, or Low determined by the erodability of adjacent soils and wetland shape. Flood control function is based on a wetland's landscape position. The peak flow of a two-year storm is reduced by 14% by valley wetlands, 12% by hillside wetlands, and 11% by hilltop wetlands. A wetland's wildlife value is given an overall rating of High, Medium, or Low based on its size and diversity of vegetation classes (Marble and Gross 1984). There is no overall score assigned to each wetland. The information from this method can be used to identify potential threats to a wetland from adjacent development activities (Marble and Gross 1984). The authors, Marble and Gross (1984), state that this method does evaluate some wetland values that are important to an overall assessment of a wetland, such as recreational, scenic, and educational value.

Model for the Assessment of Visual/Cultural Values of Wetlands (Visual/Cultural Assessment)

The Visual/Cultural Assessment Model was developed in Massachusetts as part of an overall inland-wetland assessment model to incorporate the visual-cultural resources of wetlands into the decision making process to facilitate better land use decisions regarding inland wetlands. Visual/cultural resources are "the finite natural resources available for human use that are perceived, found within, or associated with wetland areas (Smardon and Fabos 1983)." The Visual/Cultural Model is comprised of two parts: a two-part wetland classification system, and the visual/cultural resource evaluation. The first part of the classification system describes the wetland's interior landscape through the identification of the wetland's type (i.e. fresh marsh, wooded swamp). The second classification identifies the wetland's surrounding landscape context by incorporating surrounding land use and the underlying landforms. The visual/cultural resource evaluation consists of a three-level elimination process. Level 1 identifies wetlands with outstanding value that warrant top priority for protection. Three values are assessed: outstanding wetland natural area, general landscape value, and wetland system value. These values are qualitatively evaluated based on criteria unique to each value. Outstanding wetland natural area is determined based on best professional judgment and existing criteria from the Natural Areas Criteria Committee of the New England Botanical Club (1972) and the USDI National Park Service (1954) for identifying outstanding natural areas. General landscape value is determined by the scarcity and visual contrast of the wetland type based on a list of scarce wetland types and wetlands with outstanding visual contrast within each of the physiographic provinces in Massachusetts. The wetland system value is based on the criteria for the identification of large wetland systems within New England. All wetlands within a large wetland system should be protected. If a wetland does not meet the criteria for Level 1 protection, it is evaluated at Level 2, which rates it's visual, recreational, and educational value. Ten resource variables are measured and rated on a scale from 1 to 5, with 5 being the highest and 1 the lowest. The score for each variable is weighted by two significance coefficients: immutability, or the likelihood of the variable to change by humans or natural actions, and its multiple value, or number of values for which the variable is significant (visual, recreational, and educational). From these scores, the overall visual resource score is calculated. Higher scores indicate greater value and wetlands can be ranked from the highest to lowest values. Wetlands that do not achieve a high enough score from protection from Level 2 are evaluated at Level 3, which assesses the wetland's cultural value based on three variables: education proximity, physical accessibility, and ambient quality. Each variable is rated on a scale of 1 to 5, with 5 being the highest, and assigned a significance coefficient based on the number of values for which the variable is significant. The overall cultural value of the wetland is then calculated from an algebraic equation. The total visual-cultural resource value for a wetland is determined from the sum of the scores from the Level 2 (visual resource) and Level 3 (cultural resource) evaluations. This score can be expressed in dollars as part of economic valuation of the wetland and incorporates wildlife-habitat, visual-cultural, and water-resource values (Smardon and Fabos 1983).

Index of Biotic Integrity (IBI – for streams)

The Index of Biotic Integrity (IBI) assesses the biotic integrity of a habitat and evaluates the impact of anthropogenic actions on a biological system. Reliable and measurable metrics that indicate human influence are selected and developed. For example, ten invertebrate metrics are used as indicators of the habitat's ability to support and maintain a natural functioning biological system. Each metric is given a rating of 1, 3, or 5. A score of 5 indicates similar to or slight deviation from the reference standard; a score of 3 signifies a moderately degraded site; and a score of 1 indicates severe degradation. The overall IBI is calculated by the sum of all metric scores. IBI scores can be used to compare habitats that have the same classification type and are within the same geographic region (Bartoldus 1999).

Habitat Evaluation Procedure (HEP)

HEP was developed in 1980 by the US Fish and Wildlife Service in order to provide a method to evaluate the suitability of available habitat for selected wildlife species. HEP may be used to assess the habitat value of different areas at the same point in time, or the value of the same area at future points in time. Combining these two evaluations can determine the impact of proposed or anticipated changes on habitat suitability (Shoemaker et al. 1997). A team of evaluators delineates the cover types present in the assessment area and selects representative evaluation species that could potentially utilize the available cover types. A Habitat Suitability Index (HSI) model is applied to the assessment area for each evaluation species. Evaluators can use existing HSI models or develop new ones. The HSI score, expressed as a number between 0 and 1, is multiplied by the area of available habitat to determine the Habitat Units (HUs) for a species. Calculations can also be used to document value judgments in trade-off analysis and to perform compensation analysis. Evaluators must be HEP certified and have experience in wildlife biology (Bartoldus 1999).

Wildlife Habitat Assessment and Management System (WHAMS)

WHAMS evaluates existing wildlife habitat conditions specifically for the development of wildlife management plans on Pennsylvania State Game Lands and Farms Games Projects. It is based on the HEP methodology, but is modified to reduce application time. WHAMS does not allow for HSI model development, which is time consuming and complex. Evaluators may only use HSI models approved by the PA Game Commission. Evaluation species are selected for only the two major cover types, thereby reducing the number of HSI calculations required. Calculation of the relative value index is not included, which is required for trade-off and compensation analyses. In addition, WHAMS users do not have to be HEP certified (Bartoldus 1999).

Indicators of Hydrologic Alteration (IHA)

The Nature Conservancy developed IHA to assess the degree of alteration to ecosystem hydrology attributable to anthropogenic impacts. IHA results can be used to improve research on the biotic implications of hydrologic alteration, and to support ecosystem management and restoration plans. The method is based on 32 parameters, which are based on five fundamental hydrologic characteristics: magnitude, timing, frequency, duration, and the rate of change. Parameters are calculated from data available either from existing measurement points (i.e. stream gauges) or from model-generated data. Measures of central tendency and dispersion are calculated for each of the 32 parameters, resulting in 64 inter-annual statistics. The inter-annual statistics can be used to compare the state of one system to itself over time, the state of one system to another, or the current conditions of a system to a simulation of future impacts to the system (Richter et al. 1996). Computer software is available to facilitate data analysis. Three basic types of analysis are available: pre-impact vs. post-impact analysis (IHA analysis), range of variability analysis (RVA), and trend analysis. The IHA and RVA analyses can utilize both parametric and percentile statistical measures (The Nature Conservancy and Smythe Scientific Software 1997).

Wetland Index of Biotic Integrity (WIBI)

WIBI was developed by the Minnesota Pollution Control Agency (MPCA) to assess the ecological condition of freshwater depressional wetlands. The method utilizes two indexes, the vegetation WIBI and the invertebrate WIBI, to evaluate the degree of human impact on seasonal, semipermanent, and permanent depressional wetlands. The invertebrate WIBI is more appropriate for wetter depressional wetlands, while the vegetation WIBI is effective in vegetated depressional wetlands. The method needs to be modified for application in vernal pools, lake fringes, riparian wetlands, sedge meadows, fens, and bogs. The vegetation WIBI is comprised of ten metrics, which measure richness, life-form guild distribution, sensitive and tolerant species, and community structure. Each metric is rated 1, 3, or 5, where a score of 5 indicates slight or no degradation, and a score of 1 indicates severe degradation. The score of the individual metrics are summed to reach a total site score that defines the site condition. An overall vegetation WIBI score between 50 and 36 indicates excellent conditions that meet aquatic life expectations. Scores between 34 and 20 indicate good conditions that meet aquatic life expectations but may be threatened, and scores between 18 and 10 indicate poor conditions that do not meet aquatic life expectations. The invertebrate WIBI consists of ten metrics that measure invertebrate community proportions and richness. Similar to the vegetation WIBI, each metric is rated 1, 3, or 5, and the sum of all ten metric scores determines the overall invertebrate index score. Scores between 50 and 36 indicate excellent condition, between 34 and 24 indicate moderate conditions, and between 22 and 10 indicate poor conditions (Gernes and Helgen 1999).

New England Freshwater Invertebrate Biomonitoring Protocol (NEFWIBP)

The main goal of the New England Freshwater Invertebrate Biomonitoring Protocol (NEFWIBP) is to provide a standardized, cost-effective method to assess the impact of urbanization on permanently flooded freshwater wetlands. It can also be used to inventory the condition of wetlands within a watershed, to evaluate restoration success, to monitor wetland creation or mitigation progress, and to guide watershed management through risk assessment. NEFWIBP is comprised of an invertebrate community assessment and an overall habitat assessment to evaluate ecological integrity (Hicks 1997). Thirteen habitat quality indicators are rated on a scale from 0 to 6. The habitat assessment score is expressed as a percentage, calculated by the sum of all thirteen indicator scores divided by 78 (the maximum possible sum) and multiplied by 100. For the invertebrate assessment, aquatic invertebrates are sampled, sorted, identified, and counted. Eleven invertebrate community metrics are scored from 0 to 6, and the overall invertebrate community index (ICI) is calculated from the sum of the scores for the eleven metrics divided by 66 (the maximum possible score) and multiplied by 100. The habitat assessment score and the invertebrate community index (ICI) are plotted on a wetland status summary graph to determine the overall ecological impairment to the wetland. NEFWIBP is directly related to the Index of Biotic Integrity (IBI) and may be considered a subset of IBI (Bartoldus 1999).

Appendix C

Sample Method Instruction and Data Sheets for the Functional Assessment Methods Implemented in WMA6

Wetland Functions and Values: A Descriptive Approach

Source: (U.S. Army Corps of Engineers 1995)

Wetland Function-Value Evaluation Form

Total area of wetland______ Human made?______ Is wetland part of a wildlife corridor?______ or a "habitat island"?______

Adjacent land use______ Distance to nearest roadway or other development______

Dominant wetland systems present______ Contiguous undeveloped buffer zone present______

Is the wetland a separate hydraulic system?______ If not, where does the wetland lie in the drainage basin?______

How many tributaries contribute to the wetland?______ Wildlife & vegetation diversity/abundance (see attached list)

Wetland I.D.______
Latitude______ Longitude______
Prepared by:______ Date______
Wetland Impact:
Type______ Area______

Evaluation based on:
Office______ Field______
Corps manual wetland delineation completed? Y______ N______

Function/Value	Occurence Y	Occurence N	Rationale (Reference #)*	Principal Function(s)/Value(s)	Comments
Groundwater Recharge/Discharge					
Floodflow Alteration					
Fish and Shellfish Habitat					
Sediment/Toxicant Retention					
Nutrient Removal					
Production Export					
Sediment/Shoreline Stabilization					
Wildlife Habitat					
Recreation					
Educational Scientific Value					
Uniqueness/Heritage					
Visual Quality/Aesthetics					
ES Endangered Species Habitat					
Other					

Notes:

* Refer to back up list of numbered considerations.

Source: (U.S. Army Corps of Engineers 1995)

Appendix A

Wetland evaluation supporting documentation and reproducible forms.

Below is an example list of considerations that was used for a New Hampshire highway project. Considerations are flexible, based on best professional judgement and interdisciplinary team consensus. This example provides a comprehensive base, however, and may only need slight modifications for use in other projects.

GROUNDWATER RECHARGE/DISCHARGE— This function considers the potential for a wetland to serve as a groundwater recharge and/or discharge area. It refers to the fundamental interaction between wetlands and aquifers, regardless of the size or importance of either.

CONSIDERATIONS/QUALIFIERS

1. Public or private wells occur downstream of the wetland.
2. Potential exists for public or private wells downstream of the wetland.
3. Wetland is underlain by stratified drift.
4. Gravel or sandy soils present in/or adjacent to the wetland.
5. Fragipan does not occur in the wetland.
6. Fragipan, impervious soils, or bedrock, does occur in the wetland.
7. Wetland is associated with a perennial or intermittent watercourse.
8. Signs of groundwater recharge are present or piezometer data demonstrates recharge.
9. Wetland is associated with a watercourse, but lacks a defined outlet or contains a constricted outlet.
10. Wetland contains only an outlet.
11. Groundwater quality of stratified drift aquifer within or downstream of wetland meets drinking water standards.
12. Quality of water associated with the wetland is high.
13. Signs of groundwater discharge are present (e.g. springs).
14. Water temperature suggests it is a discharge site.
15. Wetland shows signs of variable water levels.
16. Gravel or sandy soils present in or adjacent to wetland.
17. Piezometer data demonstrates discharge.
18. Other

FLOODFLOW ALTERATION (Storage & Desynchronization) — This function considers the effectiveness of the wetland in reducing flood damage by water retention for prolonged periods following precipitation events and the gradual release of floodwaters. It adds to the stability of the wetland ecological system or its buffering characteristics and provides social or economic value relative to erosion and/or flood prone areas.

Source: (U.S. Army Corps of Engineers 1995)

Wetland Evaluation Technique (WET)

Source: (Adamus et al. 1987)

4.4.3 Floodflow Alteration

A number of quantitative methods are available for determining the floodflow alteration capacity of AA along a channel. Qualitative methods for determining floodflow alteration capacity have been presented by Reppert et al. (1979) and Wolverton (1980). Few of these quantitative or qualitative methods specifically examine the contribution of the wetland portion of the AA to floodflow alteration.

Definition - For purposes of WET, floodflow alteration occurs in those areas where surface water is stored or its velocity is attenuated to a greater degree than typically occurs in terrestrial environments. No judgment is made as to the value of such flow alteration, in fact, there may be situations in which reduction of flow velocity causes increased flooding due to flow synchronization.

1. Floodflow Alteration Effectiveness

Rationale (HIGH) - There are five types of AA's that most clearly are effective for altering floodflows. These include AA's which : (a) have regulated outflows (reservoirs, dams), (b) have outflows that are measured as being less than inflows, (c) have neither an outlet nor an inlet, (d) expand their surface area by at least 25 percent for 20 days of the year and are larger than 5 acres, or (e) are larger than 200 acres and are either in a precipitation deficit region or (if flowing water is present) are at least 70% covered with juxtaposed woody vegetation. Additionally, they must not be tidal. Thus, the simple presence of vegetation which adds to channel roughness is considered insufficient to result in a rating of HIGH; the wet depression must remove (through evapotranspiration) or store water as well as create a lag (desynchronized) effect.

Rationale (LOW) - Wetlands with LOW probabilities of altering floodflows are assumed to be those which have <u>all</u> the following characteristics: (a) the spatially dominant hydroperiod is "permanent," (b) the AA is less than 200 acres, (c) no potential for ponding of stormflows is apparent (e.g., fringe wetland or others with unconstricted outlets), (d) if precipitation is greater than evaporation, and the AA is smaller than 5 acres, and (e) if flow is present, channels are neither sinuous nor contain ample woody vegetation to intercept surface flows. Also, all tidal wetlands are rated LOW, as they are a buffer against floodflows only if mild storm surges occur at low tide.

General Sensitivity - Most western and prairie wetlands will be rated HIGH, as will large flowing wetlands elsewhere with extensive woody vegetation. LOW ratings will be assigned to most small, unconstricted, permanently flooded wetlands in the East, especially if they lack low-gradient channels and woody vegetation. The MODERATE rating will be the most common rating in many regions.

These ratings do not reflect the <u>quantity</u> (e.g., acre-feet) of flood storage--only the probability that storage or loss will occur or lag time will be measurably increased. The position of the wetland in the watershed and its position relative to floodable properties have been ignored in this portion of the key due to the difficulty of predicting whether increased lag time will synchronize or desynchronize floodflows at a particular point of interest.

Source: (Adamus et al. 1987)

Evaluation Site: ______________________________

EFFECTIVENESS/OPPORTUNITY EVALUATION - LEVEL 1 (OFFICE)

	WETLAND CONDITION			COMMENTS/ASSUMPTIONS
Q.#	$\overline{X}$	W	D	
1.1	Y N			
1.2	Y N			
1.3	Y N			
2.1.1	Y N			
2.1.2	Y N			
2.1.3	Y N			
2.2.1	Y N I			
2.2.2	Y N I			
3.1	Y N			
3.2	Y N			
3.3	Y N			
4.1	Y N			
4.2A	Y N			
4.2B	Y N			
4.2C	Y N			
4.2D	Y N			
5.1.1		Y N		
5.1.2		Y N		
5.2		Y N		
6.1	Y N			
6.2	Y N			
7	Y N I			
8.1	Y N			
8.2	Y N			
8.3	Y N			
8.4	Y N			
9.1		Y N		
9.2		Y N I		
9.3		Y N I		
10A	Y N			
10B	Y N			
10C	Y N			
10D	Y N			
10E	Y N			
10F	Y N			

Source: (Adamus et al. 1987)

Floodflow Alteration Opportunity (FFAO) Key

(10D+E+F=n)
not marine, estuarine or tidal

F → LOW

T ↓

BOTH of the following:

1. (5.2=n or 5.1.2=n)
   upslope AA's are <5% of AA's watershed or
   AA <20% of watershed acreage
2. [(21B=y) or (24.4=y)]
   watershed impervious or watershed soils with slow infiltration

T → HIGH

F ↓

ALL of the following:

1. (5.1.2=y)
   AA >20% of watershed acreage
2. (21A=y)
   watershed forest and scrub
3. (5.2=y)
   upslope wetlands comprise >5% of AA's watershed
4. (24.4=n)
   watershed soils do not have slow infiltration

T → LOW

F → MODERATE

-- End --

Source: (Adamus et al. 1987)

Wisconsin Rapid Assessment Methodology

(WI RAM)

Source: (Wisconsin Dept. of Natural Resources 1992)

FUNCTIONAL ASSESSMENT

The following assessment requires the evaluator to examine site conditions that provide evidence that a given functional value is present and to assess the significance of the wetland to perform those functions. Positive answers to questions indicate the presence of factors important for the function. The questions are not definitive and are only provided to guide the evaluation. After completing each section, the evaluator should consider the factors observed and use best professional judgement to rate the significance. The ratings should be recorded on page 1 of the assessment.

Special Features/ RED FLAGS

1. Y N Is the wetland in or adjacent to an area of special natural resource interest (NR 103.04, Wis. Adm. Code)? If so, check those that apply:

___a. Cold water community as defined in s. NR 102.04(3)(b), Wis. Adm. Code, (including trout streams, their tributaries, and trout lakes);
___b. Lakes Michigan and Superior and the Mississippi River;
___c. State or federal designated wild and scenic river;
___d. Designated state riverway;
___e. Designated state scenic urban waterway;
___f. Environmentally sensitive area or environmental corridor identified in an area-wide water quality management plan, special area management plan, special wetland inventory study, or an advanced delineation and identification study;
___g. Calcareous fen;
___h. State park, forest, trail or recreation area;
___i. State and federal fish and wildlife refuges and fish and wildlife management areas;
___j. State or federal designated wilderness area;
___k. Designated or dedicated state natural area;
___l. Wild rice water listed in ch. NR 19.09, Wis. Adm. Code;
___m. Surface water identified as an outstanding or exceptional resource water in ch. NR 102, Wis. Adm. Code.

2. Y N According to the Natural Heritage Inventory (Bureau of Endangered Resources) or direct observations, are there any rare, endangered, or threatened plant or animal species in, near, or using the wetland or adjacent lands? If so, list the species of concern:

3. Y N Is the project located in an area that requires a State Coastal Zone Management Plan consistency determination?

Source: (Wisconsin Dept. of Natural Resources 1992)

Floral Diversity

1. Y N Does the wetland support a variety of native plant species (i.e. not a monotypic stand of cattail or giant reed grass and/or not dominated by exotic species such as reed canary grass, brome grass, buckthorn, purple loosestrife, etc.)?

2. Y N Is the wetland plant community regionally scarce or rare?

Wildlife and Fishery Habitat

1. List any species observed, evidenced (e.g. tracks, scat, nest/burrow, calls), or expected to utilize the wetland:

2. Y N Does the wetland contain a number of diverse vegetative cover types and a high degree of interspersion of those vegetation types?

3. Y N Is the estimated ratio of open water to cover between 30 and 70 percent? What is the estimated ratio? ________%

4. Y N Does the surrounding upland habitat likely support a variety of animal species?

5. Y N Is the wetland part of or associated with a wildlife corridor or designated environmental corridor?

6. Y N Is the surrounding habitat and/or the wetland itself a large tract of undeveloped land important for wildlife that require large home ranges (e.g. bear, woodland passerines)?

7. Y N Is the surrounding habitat and/or the wetland itself a relatively large tract of undeveloped land within an urbanized environment that is important for wildlife?

8. Y N Are there other wetland areas near the subject wetland that may be important to wildlife?

9. Y N Is the wetland contiguous with a permanent waterbody or periodically inundated for sufficient periods of time to provide spawning/nursery habitat for fish?

10. Y N Can the wetland provide significant food base for fish and wildlife (e.g. insects, crustaceans, voles, forage fish, amphibians, reptiles, shrews, wild rice, wild celery, duckweed, pondweeds, watermeal, bulrushes, bur reeds, arrowhead, smartweeds, millets...)?

11. Y N Is the wetland located in a priority watershed/township as identified in the Upper Mississippi and Great Lakes Joint Venture of the North American Waterfowl Management Plan?

12. Y N Is the wetland providing habitat that is scarce to the region?

Source: (Wisconsin Dept. of Natural Resources 1992)

Technique for the Functional Assessment of Nontidal Wetlands in the Coastal Plain of Virginia
(VIMS)

Source: (Bradshaw 1991)

Function: Flood storage and storm flow modification

This function addresses the storage of water in the wetland and/or the reduction of water velocity by the wetland so that downstream movement of water is impeded (Adamus et al., 1990). Many wetlands store flood water and later release it. In doing so, the magnitude of flooding downstream from the wetlands may be reduced.

There are many factors and characteristics which determine the extent and existence of flood storage and flood flow modification by a wetland. Characteristics which enhance a wetland's opportunity to store floodwater and modify flood peaks are primarily watershed characteristics which increase the quantity and velocity of water entering the wetland:

- watersheds receiving frequent, intense rainstorms
- large watershed area
- steep slopes in watershed
- smooth land cover
- soils or land cover of slow or low permeability
- lack of upstream storage for flood water (e.g., channelized streams; no ponds or wetlands upstream of the wetland of interest)

A wetland's effectiveness at flood storage and flow modification depends on its capacity relative to the volume of inflow and its ability to hold water and reduce flow velocity. Characteristics which enhance a wetland's effectiveness in flood storage and flow modification:

- wetlands large relative to watershed
- wetlands not permanently flooded
- outlet from wetland constricted
- channel sinuosity within wetland is great
- wetland vegetation density is great (# stems/acre)
- stems of wetland plants are rigid

Methods for assessing the flood storage/flood flow modification function of wetlands range from a simplistic ratio of the area of the wetland to the area of the wetland's watershed (Reppert et al., 1979; Ammann et al., 1991) to complex computer simulation modeling of flood flows through wetlands (Kittelson, 1988; Ogawa and Male, 1986). An alternative approach is used by the WET methods (Adamus et al., 1987, 1990), which identify characteristics of wetlands and their watersheds which enhance or detract from the wetland's opportunity and ability to perform the function, and use these characteristics to produce a probability rating (High, Moderate, Low) for the wetland's opportunity and effectiveness at performing the function.

For the present study, a modification of the method of Simon et al. (1987) will be used as part of the evaluation of the flood storage and storm flow modification function of wetlands. This method is attractive because it provides a quantitative, volumetric measure of the flood storage capacity, rather than simply a qualitative High/Moderate/Low rating of the function as with the WET methods. Although the modeling methods (e.g., Kittelson, 1988; Ogawa and Male, 1986) would provide a more complete picture of the flood control function, those methods were determined to be inappropriate for the current level of effort. The Simon method strikes a balance be-

Source: (Bradshaw 1991)

tween the complex modeling methods and the more simplistic area ratio methods used by Connecticut (Ammann et al., 1986, 1991) and Reppert et al. (1979).

The Simon method (Simon et al., 1987) involves calculation of the volume of runoff from the watershed, based on a 2 year, 24 hour rainfall, and the land use characteristics and soil hydrologic group classification of the watershed soils. This runoff volume is then compared to the holding capacity of the wetland, which is calculated by multiplying wetland area by wetland flood storage depth. Simon et al. (1987) contend that any wetlands which have the capacity to store more than 25% of the runoff delivered from the watershed "perform a significant flood storage function."

The U.S. Department of Agriculture Soil Conservation Service (SCS) has not completed soil surveys for several of the counties in which our study was conducted. In the soil surveys that were available, some soils were not classified with respect to soil hydrologic group. Due to this lack of information, this portion of the Simon method was eliminated, and runoff calculations were based only on rainfall and land use.

The Simon method does not consider the effects on runoff conveyance of wetlands in the watershed other than the wetland of interest. The modification of the Simon method used in this study divides a wetland's watershed into two sub-watersheds: the **upstream sub-watershed** which discharges to the wetland of interest through other wetlands, and the **primary sub-watershed** which discharges directly into the wetland of interest. Runoff volume from each sub-watershed is calculated separately. Factors were generated by the SCS for adjusting discharge volume where runoff is conveyed through wetlands prior to reaching the design point in peak discharge calculations (USDA-SCS, 1986). These adjustment factors are based on the ratio of wetland to upland in the watershed, and are applied in this study to the runoff volume from the upstream sub-watershed.

The following procedure is the modification of the Simon method used for the present study:

Step 1. Delineate the following areas:

a. the wetland of interest (this should include the entire contiguous area studied which is similar in terms of vegetation structure and density)

b. the entire watershed of the wetland of interest (i.e., all uplands and wetlands which drain into the wetland of interest)

c. other wetlands occurring in this watershed (=**upstream wetlands**)

d. the portion of the watershed which discharges directly to the wetland of interest, without passing through other wetlands first (=**primary sub-watershed**)

The **upstream sub-watershed** is that portion of the watershed, including wetlands, which discharges runoff to the wetland of interest through other wetlands (the upstream wetlands). The entire watershed of the wetland of interest = upstream sub-watershed + primary sub-watershed.

Source: (Bradshaw 1991)

Step 2. Determine acreages of the wetland of interest, the primary sub-watershed, the upstream wetlands, and the upstream sub-watershed.

Area measurements will generally be made from USGS topographic maps with area dot grids or from digitizing these areas on a computerized geographic information system (GIS). For use in evaluation of other functions, calculate the following sub-watershed area weighting factors:

upstream sub-watershed area weighting factor

$$= \frac{\text{area of upstream sub–watershed}}{\text{(area of upstream sub–watershed + area of primary sub–watershed)}}$$

primary sub-watershed area weighting factor

$$= \frac{\text{area of primary sub–watershed}}{\text{(area of upstream sub–watershed + area of primary sub–watershed)}}$$

Step 3. Classify land use in the sub-watersheds. Land use will be determined using aerial photographs and field surveys. Proportions of land area within each land use will be assessed in 5% increments. Determine composite runoff curve numbers (RCN) for each of the two sub-watersheds using land use proportions and the following:

composite RCN= 55F + 70R + 81A + 92C + 80L

where:

F = proportion of sub-watershed in Forested or "natural" condition
R = proportion of sub-watershed in Residential land (houses/acre)
A = proportion of sub-watershed in Agricultural land (pasture and crops)
C = proportion of sub-watershed in Commercial/industrial/urban land
L = proportion of sub-watershed in Lakes or permanently flooded wetlands

(RCN's for each land use type were modified from Simon et al. (1987) and Kittelson (1988).)

Step 4. Find average runoff for each of the sub-watersheds, using:

$$\text{If composite RCN} \geq 35\text{, then average runoff} = \frac{\left(3.5 - 0.2 \times \left(\frac{1000}{\text{RCN}} - 10\right)\right)^2}{3.5 + 0.8 \times \left(\frac{1000}{\text{RCN}} - 10\right)}$$

If composite RCN <35, then average runoff = 0.001 inches.

This assumes a 2 year, 24 hour rainfall of 3.5 inches for the study area (Virginia Division of Soil and Water Conservation, 1980).

Source: (Bradshaw 1991)

Step 5. Multiply the average runoff from the upstream sub-watershed by the appropriate adjustment factor (USDA-SCS, 1986) to obtain adjusted average runoff:

% of upstream sub-watershed that is comprised of wetlands:	adjustment factor:
0.2	0.94
0.5	0.88
1.0	0.83
2.0	0.78
2.5	0.73
3.3	0.69
5.0	0.65
6.7	0.62
10.0	0.58
20.0	0.53
25.0	0.50

Step 6. Multiply average runoff (inches) for each sub-watershed by the area of the sub-watershed (acres) to get subtotal runoff figures (acre-inches). (For the upstream sub-watershed, use the adjusted average runoff calculated in Step 5.)

Step 7. Sum the two subtotal runoffs to get total runoff (acre-inches).

Step 8. Elevation range (inches) within wetland x 0.5 = wetland flood storage depth (inches). The elevation range is the difference in elevation between the open water/wetland boundary and the wetland/upland boundary. Where possible, we will use a hand-held level and stadia rod to determine the elevation change to the nearest tenth of a foot.

Step 9. Wetland acreage (acres) x storage depth (inches) = wetland storage (acre-inches).

Step 10. Wetland storage / total runoff = proportion of flood water stored in wetland.

The Simon method is strictly volumetric, and does not consider factors (such as watershed slope) affecting the delivery of water to the wetland. Also, this method does not consider potential damage downstream from the wetland. The Simon method, as modified, provides a measure of both the opportunity a wetland has to perform the flood storage function (i.e., runoff volume) and the wetland's effectiveness at flood storage (i.e., flood storage volume). Two additional factors will be assessed in evaluating this function. The average watershed slope will be estimated either from soil surveys or from USGS topographic maps. This provides an additional measure of the opportunity a wetland has to perform the flood storage function. Finally, a qualitative assessment of the wetland's ability to retain/detain storm water will provide an additional measure of the wetland's effectiveness at this function. A summary of factors to be assessed in determining the flood storage and flood flow modification function and the hydrologic portion of other functions follows.

Source: (Bradshaw 1991)

Factor 1: Proportion of 2 year, 24 hour storm volume stored in wetland (modification of Simon et al., 1987).

High: >25%
Low: $\leq$25%

(Simon et al. (1987) suggest the 25% threshold. Further refinement of ranking of this quantitative measure will occur following data collection.)

Factor 2: Watershed slope (%, obtained from USDA-SCS soil surveys or from USGS topo maps) (Ammann et al., 1986, 1991).

High: >8%
Moderate: 3-8%
Low: <3%

(The 3% and 8% thresholds are suggested by Ammann et al. (1986; 1991).)

Factor 3: Retention/detention of storm water within wetland (in part, Adamus et al., 1990).

High: detention time likely to be great due to significant constriction at outlet, very sinuous channels within the wetland, ponding within the wetland, high vegetation density within the wetland (stems/acre), and/or the wetland plants have rigid stems

Moderate: detention time likely to be intermediate

Low: detention time likely to be short due to lack of constriction at the wetland outlet, channelized flow through the wetland, low vegetation density within the wetland, and/or lack of vegetation with rigid stems.

In order to lessen the subjectivity of ranking this factor, priority will be given to the physical characteristics affecting retention/detention (i.e., outlet constriction, channel sinuosity, and ponding), and secondarily to the vegetation characteristics. Generally, we will consider forested wetlands to be of low stem density, scrub-shrub and non-persistent emergent wetlands to be of moderate density, and persistent emergent wetlands to be of high stem density. Actual field assessment may alter these guidelines. Woody species and some emergents will be considered to have rigid stems; other emergents will be considered to have non-rigid stems.

Overall ranking of flood storage and storm flow modification function:

A wetland will be rated as having a HIGH probability of performing the flood storage/flood flow modification function if either Factor 1 or Factor 3 is HIGH. A wetland will be rated as having a LOW probability of performing this function if Factor 3 and at least one of the other factors is rated LOW. All other wetlands will be rated MODERATE.

Source: (Bradshaw 1991)

Flood storage and flood flow modification

Calculation of Factor 1:

Step 1. Delineate the wetland of interest, its entire watershed, and other wetlands within that watershed, using USGS topo maps. Sub-divide these areas as follows:

Wetland of interest = entire contiguous area studied which is similar in vegetation structure and density.

Primary sub-watershed = that portion of the wetland of interest's watershed which discharges directly into the wetland of interest without passing through other wetlands first.

Upstream sub-watershed = that portion of the wetland of interest's watershed which discharges to the wetland of interest through other wetlands (this includes the upstream wetlands).

Upstream wetlands = wetlands in the upstream sub-watershed.

Step 2. Determine acreages:

Wetland of interest ________ acres (X1)
Primary sub-watershed ________ acres (X2)
Upstream sub-watershed (including upstream wetlands) ________ acres (X3)
Upstream wetlands ________ acres (X4)

Calculate (for use in assessment of water quality functions):

upstream sub-watershed area weighting factor

$$= \frac{X3}{(X2 + X3)} = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \quad (X5)$$

primary sub-watershed area weighting factor

$$= \frac{X2}{(X2 + X3)} = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \quad (X6)$$

Step 3. Determine the elevation range within the wetland of interest. The elevation range is the difference in elevation between the open water/wetland boundary and the wetland/upland boundary.

Elevation range = __________ inches (X7)

Source: (Bradshaw 1991)

Step 4. Classify land use in each sub-watershed.

Proportion of sub-watershed in each land use (Range of values = 0 to 1. Estimate to the nearest 0.05. The sum of each column = 1.0):

Sub-watershed Primary	Sub-watershed Upstream	Land use
Fp=	Fu=	Forested/"natural"
Ap=	Au=	Agricultural (pasture & crop land)
Rp=	Ru=	Residential (< 4 houses/acre)
Cp=	Cu=	Commercial/Industrial/Urban land
Lp= 0	Lu=	Lakes or permanently flooded wetlands
1.0	1.0	= Sum

Determine composite runoff curve numbers (RCN) for each sub-watershed, using land proportions and the following equations:

upstream sub-watershed composite RCN

$$= (55 \times Fu) + (81 \times Au) + (70 \times Ru) + (92 \times Cu) + (80 \times Lu)$$

$$= (55 \times \_\_\_\_) + (81 \times \_\_\_\_) + (70 \times \_\_\_\_) + (92 \times \_\_\_\_) + (80 \times \_\_\_\_) = \_\_\_\_\_\_ \quad (X8)$$

primary sub-watershed composite RCN

$$= (55 \times Fp) + (81 \times Ap) + (70 \times Rp) + (92 \times Cp) + (80 \times Lp)$$

$$= (55 \times \_\_\_\_) + (81 \times \_\_\_\_) + (70 \times \_\_\_\_) + (92 \times \_\_\_\_) + (80 \times \_\_\_\_) = \_\_\_\_\_\_ \quad (X9)$$

Step 5. Find average runoff for each of the sub-watersheds:

If composite RCN ≥ 35, then average runoff= $\dfrac{\left(3.5 - 0.2 \times \left(\dfrac{1000}{RCN} - 10\right)\right)^2}{3.5 + 0.8 \times \left(\dfrac{1000}{RCN} - 10\right)}$

If composite RCN < 35, then average runoff = 0.001 inches.

This assumes a 2 year, 24 hour rainfall of 3.5 inches for the study area (Virginia Division of Soil and Water Conservation, 1980).

Source: (Bradshaw 1991)

upstream sub-watershed average runoff =

$$\frac{\left(3.5 - 0.2 \times \left(\frac{1000}{X8} - 10\right)\right)^2}{3.5 + 0.8 \times \left(\frac{1000}{X8} - 10\right)} = \_\_\_\_\_\_\_\_\_\_ \quad (X10)$$

primary sub-watershed average runoff =

$$\frac{\left(3.5 - 0.2 \times \left(\frac{1000}{X9} - 10\right)\right)^2}{3.5 + 0.8 \times \left(\frac{1000}{X9} - 10\right)} = \_\_\_\_\_\_\_\_\_\_ \quad (X11)$$

Step 6. Multiply the average runoff from the upstream sub-watershed (X10) by the appropriate adjustment factor (USDA-SCS, 1986) to obtain adjusted average runoff:

% of upstream sub-watershed that is comprised of wetlands:	adjustment factor:
0.2	0.94
0.5	0.88
1.0	0.83
2.0	0.78
2.5	0.73
3.3	0.69
5.0	0.65
6.7	0.62
10.0	0.58
20.0	0.53
25.0	0.50

adjusted average runoff for upstream sub-watershed

= X10 x adjustment factor = __________________ inches (X12)

Step 7. Multiply average runoff (inches) for each sub-watershed by the area of the sub-watershed (acres) to get subtotal runoff figures (acre-inches).

primary sub-watershed total runoff = X11 x X2 = _______ acre-inches (X13)
upstream sub-watershed total runoff = X12 x X3 = _______ acre-inches (X14)

Step 8. Sum the two subtotal runoffs to get total runoff (acre-inches).

total runoff = X13 + X14 = ______________ acre-inches (X15)

Source: (Bradshaw 1991)

Step 9. Determine flood storage depth in the wetland of interest (assumed to be half the elevation range within the wetland).

wetland flood storage depth = X7 x 0.5 = ____________________ inches (X16)

Step 10. Determine wetland storage capacity.

Wetland acreage (acres) x storage depth (inches) = wetland storage (acre-inches).

X1 x X16 = ______________________________ acre-inches (X17)

Step 11. Determine proportion of flood water stored in wetland.

$$\frac{\text{Wetland storage}}{\text{total runoff}} = \text{proportion of flood water stored in wetland}$$

$$\frac{X17}{X15} = \text{\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_} \text{ (range of values = 0 to 1)}$$

Source: (Bradshaw 1991)

Factor 1 calculation worksheet—flood storage and flood flow modification

Step 1. Delineation.

Step 2. Wetland of interest = ______ acres (X1)

Primary sub-watershed = ______ acres (X2)

Upstream sub-watershed (including upstream wetlands) = ______ (X3)

Upstream wetlands = ______ (X4)

$$\frac{X3}{(X2 + X3)} = \underline{\qquad\qquad\qquad\qquad} \ (X5) \qquad \frac{X2}{(X2 + X3)} = \underline{\qquad\qquad\qquad\qquad} \ (X6)$$

Step 3. Elevation range = ______________ inches (X7)

Step 4.

upstream sub-watershed composite RCN

= (55 x Fu) + (81 x Au) + (70 x Ru) + (92 x Cu) + (80 x Lu)

= (55 x ____)+(81 x ____)+(70 x ____)+(92 x ____)+(80 x ____) = _______ (X8)

primary sub-watershed composite RCN

= (55 x Fp) + (81 x Ap) + (70 x Rp) + (92 x Cp) + (80 x Lp)

= (55 x ____)+(81 x ____)+(70 x ____)+(92 x ____)+(80 x ____) = _______ (X9)

Step 5.

upstream sub-watershed average runoff =

$$\frac{(3.5 - 0.2 \times \left(\frac{1000}{X8} - 10\right))^2}{3.5 + 0.8 \times \left(\frac{1000}{X8} - 10\right)} = \underline{\qquad\qquad\qquad} \ (X10)$$

primary sub-watershed average runoff =

$$\frac{(3.5 - 0.2 \times \left(\frac{1000}{X9} - 10\right))^2}{3.5 + 0.8 \times \left(\frac{1000}{X9} - 10\right)} = \underline{\qquad\qquad\qquad} \ (X11)$$

Step 6. X10 x adjustment factor = ________________________ inches (X12)

Step 7. X11 x X2 = ____________________ acre-inches (X13)

X12 x X3 = ____________________ acre-inches (X14)

Step 8. X13 + X14 = ____________________ acre-inches (X15)

Step 9. X7 x 0.5 = ____________________ inches (X16)

Source: (Bradshaw 1991)

Step 10. X1 x X16 = ____________________ acre-inches (X17)

Step 11. $\frac{X17}{X15}$ = ____________________ (range of values = 0 to 1)

Source: (Bradshaw 1991)

Flood storage and flood flow modification

Factor ratings

Factor 1: Proportion of 2 year, 24 hour storm volume stored in wetland

___High: >25%
___Low: ≤25%

Factor 2: Watershed slope

___High: >8%
___Moderate: 3-8%
___Low: <3%

Factor 3: Retention/detention of storm water within wetland (priority: physical characteristics; secondary: vegetation characteristics

___High: detention time likely to be great due to significant constriction at outlet, very sinuous channels within the wetland, ponding within wetland, high vegetation density within the wetland (stems/acre), and/or the wetland plants have rigid stems

___Moderate: detention time likely to be intermediate

___Low: detention time likely to be short due to lack of constriction at the wetland outlet, channelized flow through the wetland, low vegetation density within the wetland, and/or lack of vegetation with rigid stems.

Interpretation Key

1. Are either Factor 1 or Factor 3 HIGH?

    Y—HIGH
    N—go to 2.

2. Is Factor 3 MODERATE?

    Y—MODERATE
    N—go to 3

3. Are at least 2 of the 3 Factors MODERATE or HIGH?

    Y—MODERATE
    N—LOW

Source: (Bradshaw 1991)

VIMS Nontidal Wetlands Functional Assessment Method—Summary Sheet

Flood storage and flood flow alteration

Factor 1: H L
Factor 2: H M L
Factor 3: H M L

Overall: H M L

Nutrient retention and transformation

Factor 1: H M L
Factor 2: H M L
Factor 3: H M L
Factor 4: H M L
Factor 5: H L
Factor 6: H M L

Overall: H M L

Sediment/toxicant retention

Factor 1: H M L
Factor 2: H M L
Factor 3: H M L
Factor 4: H M L
Factor 5: H M L
Factor 6: H M L
Factor 7: H L
Factor 8: H M L

Overall:
Sediment trapping: H M L
Toxicant trapping: H M L

Sediment stabilization

Factor 1: H L
Factor 2: H L
Factor 3: H L
Factor 4: H M L

Overall: H M L

Wildlife habitat

Factor 1: H M L
Factor 2: H M L
Factor 3: H M L
Factor 4: H M L
Factor 5: H M L

Overall: H M L

Aquatic habitat

Factor 1: H L
Factor 2: H L
Factor 3: H M L
Factor 4: H M L
Factor 5: H L

Overall: H M L

Public use

Factor 1: H M L

Other factors

Factor 1: H M L
Factor 2: H M L

Source: (Bradshaw 1991)

Guidance for Rating the Values of Wetlands in North Carolina
(NC Guidance)

Source: (North Carolina Dept. of Environmental and Natural Resources 1995)

WETLAND RATING WORKSHEET Fourth Version

Project Name ______________________ Nearest Road ____________
County ____________ Wetland Area ________ acres Wetland Width ________ feet
Name of evaluator ______________________________ Date ________

Wetland Location	**Adjacent land use** (within 1/2 mile upstream, upslope, or radius)
___ on pond or lake ___ on perennial stream ___ on intermittent stream ___ within interstream divide ___ other ____________	___ forested/natural vegetation ____ % ___ agriculture, urban/suburban ____ % ___ impervious surface ____ %
	Dominant vegetation
Soil series ________________	(1) ________________ (2) ________________ (3) ________________
___ predominantly organic - humus, muck, or peat ___ predominantly mineral - non-sandy ___ predominantly sandy	
Hydraulic factors	**Flooding and wetness**
___ steep topography ___ ditched or channelized ___ total wetland width ≥100 feet	___ semipermanently to permanently flooded or inundated ___ seasonally flooded or inundated ___ intermittanly flooded or temporary surface water ___ no evidence of flooding or surface water

Wetland type (select one)*

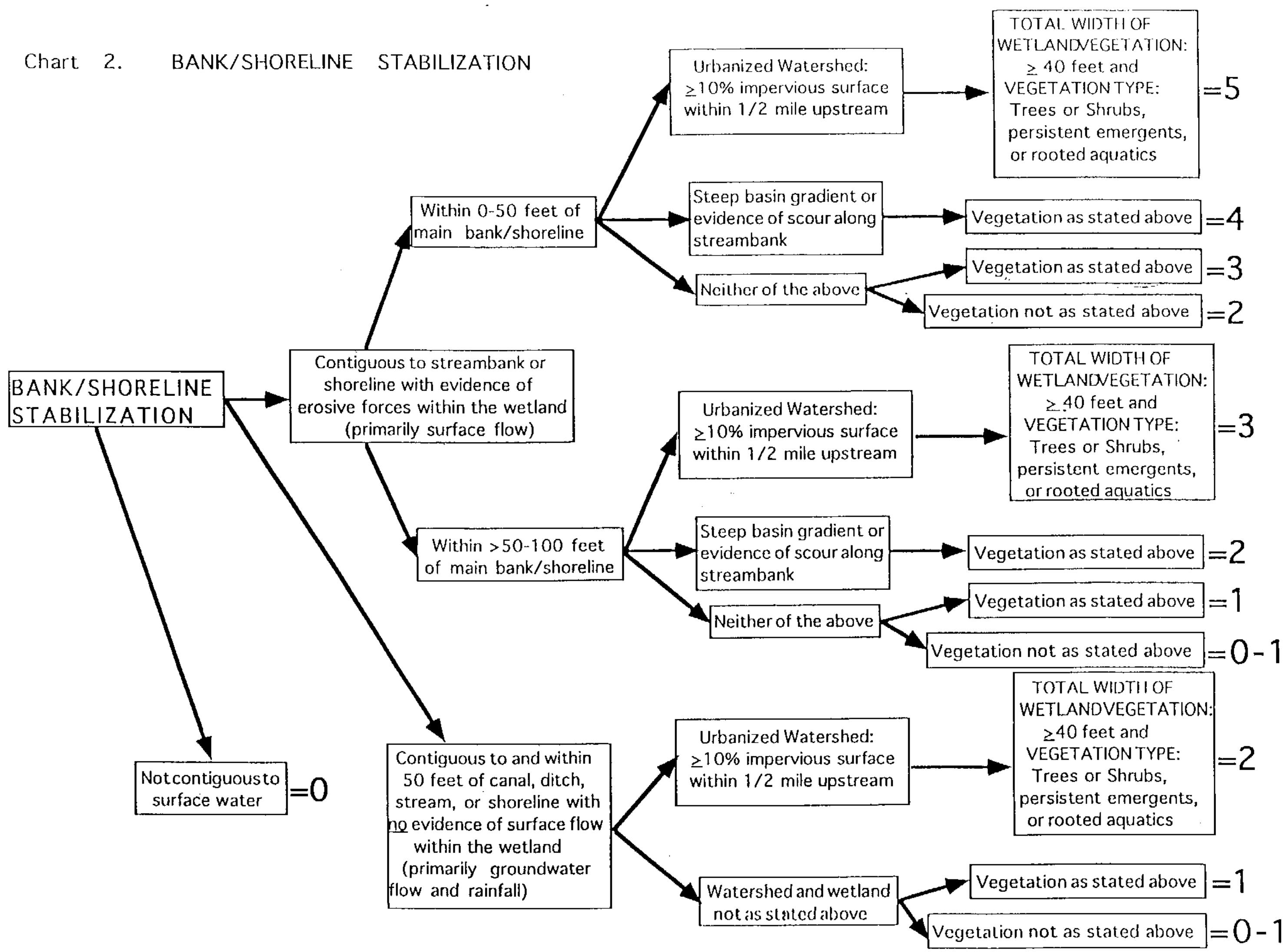
___ Bottomland hardwood forest	___ Pine savanna
___ Headwater forest	___ Freshwater marsh
___ Swamp forest	___ Bog/fen
___ Wet flat	___ Ephemeral wetland
___ Pocosin	___ Carolina Bay
___ Bog forest	___ Other ________

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

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

*Add 1 point if in sensitive watershed and >10% nonpoint disturbance within 1/2 mile upstream, upslope, or radius

Source: (North Carolina Dept. of Environmental and Natural Resources 1995)



Source: (North Carolina Dept. of Environmental and Natural Resources 1995)

Maryland Department of the Environment Method for the Assessment of Wetland Function (MDE)

Source: (Fugro East 1995)

WETLAND INVENTORY DATA

'roject Name: ____________________ Date: ____________________

.land Number: ____________________ Investigators: ____________________

Cowardin Class: ____________________ Area: ____________________

____________________ Area: ____________________

____________________ Area: ____________________

____________________ Total Area: ____________________

Hydrogeomorphic Class

- ☐ Depressional
- ☐ Slope
- ☐ Lacustrine Fringe
- ☐ Riverine
- ☐ Mosaic

Dominant Vegetation Type Palustrine

- ☐ **Aquatic Bed**
  - ☐ Algal
  - ☐ Aquatic Moss
  - ☐ Rooted Vascular
  - ☐ Floating Vascular
  - ☐ Unknown Submergent
  - ☐ Unknown Surface
- ☐ **Emergent**
  - ☐ Persistent
  - ☐ Nonpersistent
- ☐ **Open Water**
- ☐ **Shrub/Scrub**
  - ☐ Broad-leaved Deciduous
  - ☐ Needle-leaved Deciduous
  - ☐ Broad-leaved Evergreen
  - ☐ Needle-leaved Evergreen
  - ☐ Dead
- ☐ **Forested**
  - ☐ Broad-leaved Deciduous
  - ☐ Needle-leaved Deciduous
  - ☐ Broad-leaved Evergreen
  - ☐ Needle-leaved Evergreen
  - ☐ Dead

Water Regime

- ☐ Temporarily Flooded
- ☐ Saturated
- ☐ Seasonally Flooded
- ☐ Semi Permanently Flooded
- ☐ Intermittently Exposed
- ☐ Permanently Flooded
- ☐ Intermittently Flooded
- ☐ Artificially Flooded

Source: (Fugro East 1995)

LANDSCAPE VARIABLES

Size
- ☐ > 100 acres
- ☐ 10 - 100 acres
- ☐ < 10 acres

Wetland Juxtaposition
- ☐ Connected upstream and downstream
- ☐ Only connected above
- ☐ Only connected below
- ☐ Other wetlands nearby but not connected
- ☐ Wetland isolated

Watershed Land Use
- ☐ > 90% of two or more non-urban cover types
- ☐ 50-90% of one or more; >90% of non-urban cover type
- ☐ < 50% of one or more of non-urban cover types

Regional Scarcity of Wetland Vegetation Type
- ☐ Not scarce
- ☐ Scarce

Wetland's Land Use
- ☐ High intensity
- ☐ Moderate intensity
- ☐ Low intensity

Topographic Position of Wetland in the Watershed
- ☐ Isolated
- ☐ Headwater (order 1 & 2)
- ☐ Lower reach (order 3 and above)

Is the Wetland a Fragment of a Once Larger and Complete Wetland?
- ☐ Yes
- ☐ No

HYDROLOGIC VARIABLES

Surface Water Level Fluctuation of Wetland
- ☐ High
- ☐ Low
- ☐ No fluctuation

Surface Hydrologic Water Connection
- ☐ Not connected
- ☐ Connected to an intermittent stream
- ☐ Connected to a perennial stream or river
- ☐ Connected to a lake

Nested Piezometer Data
- ☐ Recharge condition
- ☐ Discharge condition
- ☐ Horizontal flow

Relationship of Wetland's Substrate to Regional Potentiometric Surface
- ☐ Piezometric surface above wetland substrate
- ☐ Piezometric surface below wetland substrate

Water Regime
- ☐ Wet regimes
- ☐ Dry regimes

Water Chemistry
- ☐ Fresh < 800 µ Mos

pH
- ☐ Acid < 5.5
- ☐ Circumneutral 5.5 - 7.4
- ☐ Alkaline > 7.4

Surficial Geologic Deposit Under Wetland
- ☐ Low permeability deposits
- ☐ High permeability deposits

Basin Topographic Gradient
- ☐ High gradient > 2%
- ☐ Low gradient 2% or less

Degree of Outlet Restriction
- ☐ Restricted outlet
- ☐ Unrestricted outlet

Ratio of Wetland Area to Watershed Area
- ☐ Large > 10%
- ☐ Small 10% or less

Microrelief of Wetland
- ☐ Pronounced > 45 cm
- ☐ Well developed 15-45 cm
- ☐ Poorly developed < 15 cm

Does the Wetland Occur at the Base of a Steep Slope?
- ☐ Yes
- ☐ No

Is the Wetland Adjacent to or Part of a Critical Area of Special Concern?
- ☐ Yes
- ☐ No

Wetland Occurrence at Base of Steep Slope
- ☐ Does occur
- ☐ Does not occur

Source: (Fugro East 1995)

Evidence of Springs and Seeps
- ☐ No seeps or springs
- ☐ Seeps only
- Perennial spring
- ☐ Intermittent spring

Wet Regime Within a Drier Regime
- ☐ Yes
- ☐ No

Evidence of Sedimentation
- ☐ No evidence observed
- ☐ Sediment observed on Wetland Substrate
- ☐ Fluviquent soil present

Frequency of Overbank Flooding
- ☐ High 5 or less years
- ☐ Moderate 6 to 20 years
- ☐ Low > 20 years to 100 years

Potential for Overland Flows From Surrounding Upland
- ☐ High potential > 100 acres
- ☐ Low potential 100 or less

.t - Outlet Class
- ☐ No inlet - no outlet
- ☐ No inlet - intermittent outlet
- ☐ No inlet - perennial outlet
- ☐ Intermittent inlet - no outlet
- ☐ Intermittent inlet - intermittent outlet
- ☐ Intermittent inlet - perennial outlet
- ☐ Perennial inlet - no outlet
- ☐ Perennial inlet - intermittent outlet
- ☐ Perennial inlet - perennial outlet

Is the Wetland Associated With an Incised Stream Channel?
- ☐ Yes
- ☐ No

Does the Wetland Occur Downstream of an Urbanized Area?
- ☐ Yes
- ☐ No

Does the Stream Channel Within the Wetland Have Blockages Such as Debris, Dams?
- ☐ Yes
- No

Is the Wetland Ditched
- ☐ Yes
- ☐ No

Is the Wetland a Buffer for a Stream, River or Lake?
- ☐ Yes
- ☐ No

Is the Wetland Adjacent to a Water Body?
- ☐ Yes
- ☐ No

SOIL VARIABLES

Soil Type Histol
- ☐ Fibric
- ☐ Hemic
- ☐ Sapric

Mineral Hydric Soil
- ☐ Gravely
- ☐ Sandy
- ☐ Silty
- ☐ Clayey

VEGETATIVE VARIABLES

Dominant Wetland Type

Forested Wetland

Evergreen
- ☐ Needle-leaved

Deciduous
- ☐ Broad-leaved
- ☐ Needle-leaved

Scrub Shrub

Evergreen
- ☐ Needle-leaved

Deciduous
- ☐ Needle-leaved
- ☐ Broad-leaved

Emergent Wetland
- ☐ Persistent
- ☐ Non-persistent

Aquatic Bed
- ☐ No Vegetation

Number of Wetland Types
- ☐ >5
- ☐ 5
- ☐ 4
- ☐ 3
- ☐ 2
- ☐ 1
- ☐ No Vegetation

Source: (Fugro East 1995)

Number of Layers and Percent Cover
- ☐ Layer 1 submergents
- ☐ Layer 2 floating
- ☐ Layer 3 mosses and lichens
- ☐ Layer 4 short herbs (< 1m)
- ☐ Layer 5 tall herbs (≥ 1m)
- ☐ Layer 6 dwarf shrubs (< 0.5m)
- ☐ Layer 7 short shrubs (0.5-2m)
- ☐ Layer 8 talls shrubs (> 2-4m)
- ☐ Layer 9 saplings (> 4-5m)
- ☐ Layer 10 trees (≥ 6m)
- ☐ No Vegetation

Plant Species and Percent Cover by Layer
- ☐ 1 dominant species
- ☐ 2 codominant species
- ☐ 3 codominant species
- ☐ No Vegetation

Cover Distribution
- ☐ Continuous cover
- ☐ Small scattered patches
- ☐ One or more large patches with portions of the site open
- ☐ Solitary, scattered stems

Dead Plant Material
- ☐ Abundant
- ☐ Moderately abundant
- ☐ Low abundance
- ☐ None

Interspersion of Vegetation Cover and Open Water
- ☐ Scattered cover
- ☐ Complete cover
- ☐ Peripheral cover
- ☐ Complete open water

Shoreline/Wetland Length Ratio
- ☐ Low (.67 and higher)
- ☐ Medium (.33 to .66)
- ☐ High (less than .33)

Wetland Edge Complexity
- ☐ High convoluted
- ☐ Low level of convolution

Is the Wetland Part of a Known Wildlife Corridor?
- ☐ Yes
- ☐ No

Adjacent to Known Upland Wildlife Habitat
- ☐ Adjacent
- ☐ Not Adjacent

Evenness Distribution
- ☐ Even distribution
- ☐ Moderately even distribution
- ☐ Highly uneven distribution
- ☐ No Vegetation

Vegetative Interspersion
- ☐ High
- ☐ Moderate
- ☐ Low

Number of Layers
- ☐ >5
- ☐ 5
- ☐ 4
- ☐ 3
- ☐ 2
- ☐ 1
- ☐ No Vegetation

Stream Sinuosity
- ☐ SL/WL > 0.67
- ☐ SL/WL 0.33 - 0.66
- ☐ SL/WL <0.33
- ☐ No Stream

Presence of Islands
- ☐ Present
- ☐ Absent

Stem Density
- ☐ High
- ☐ Moderate
- ☐ Low
- ☐ No Vegetation

Adjacent to Fish Habitat
- ☐ Andromous or Catadromous
- ☐ Cold water fish
- ☐ Warm water fish
- ☐ No fish present

Habitat for Listed Species
- ☐ No listed species
- ☐ Listed species present

Does the Wetland Occur Adjacent to a Relatively Undisturbed Upland Habitat?
- ☐ Yes
- ☐ No

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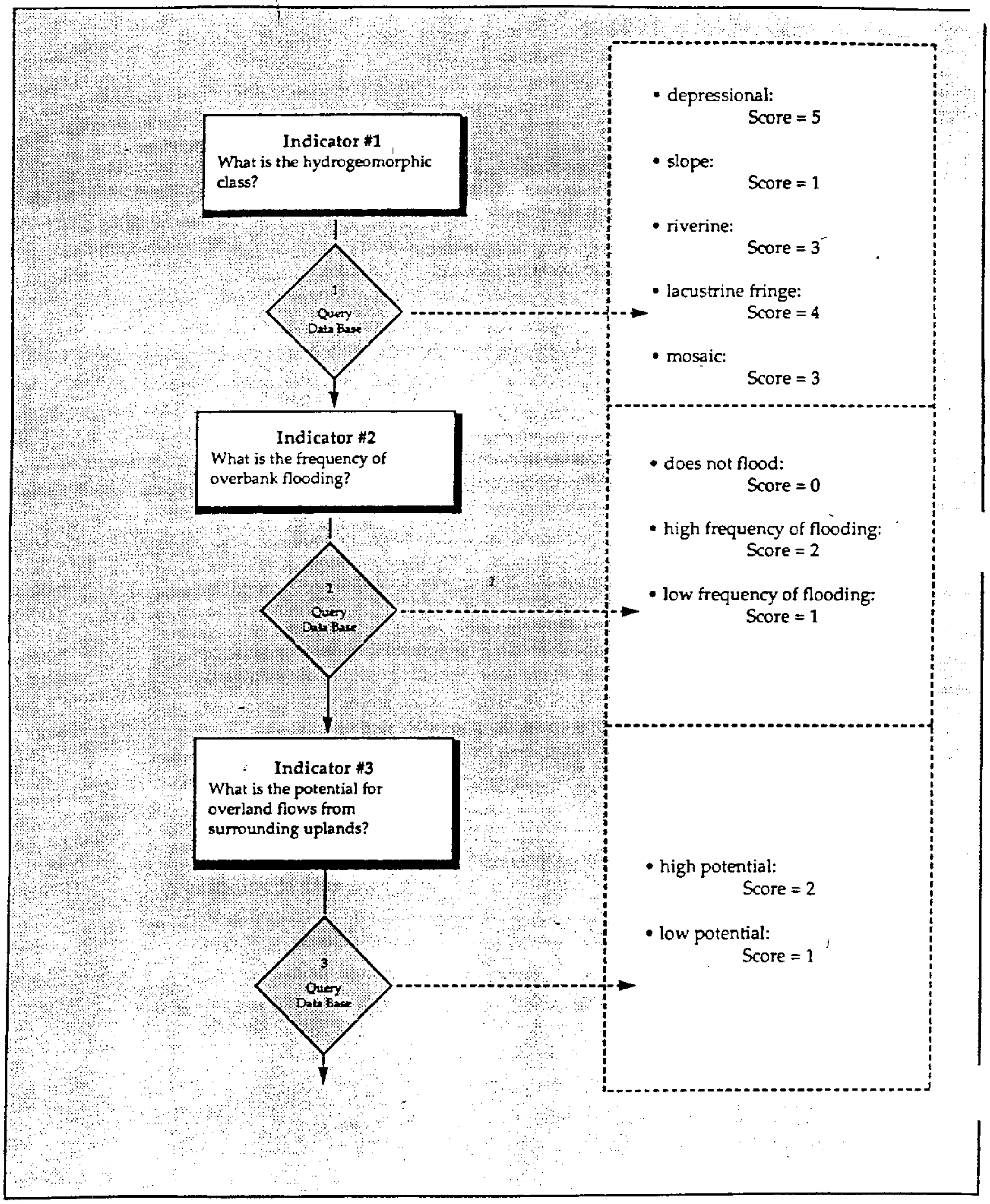
Source: (Fugro East 1995)

FIGURE 22

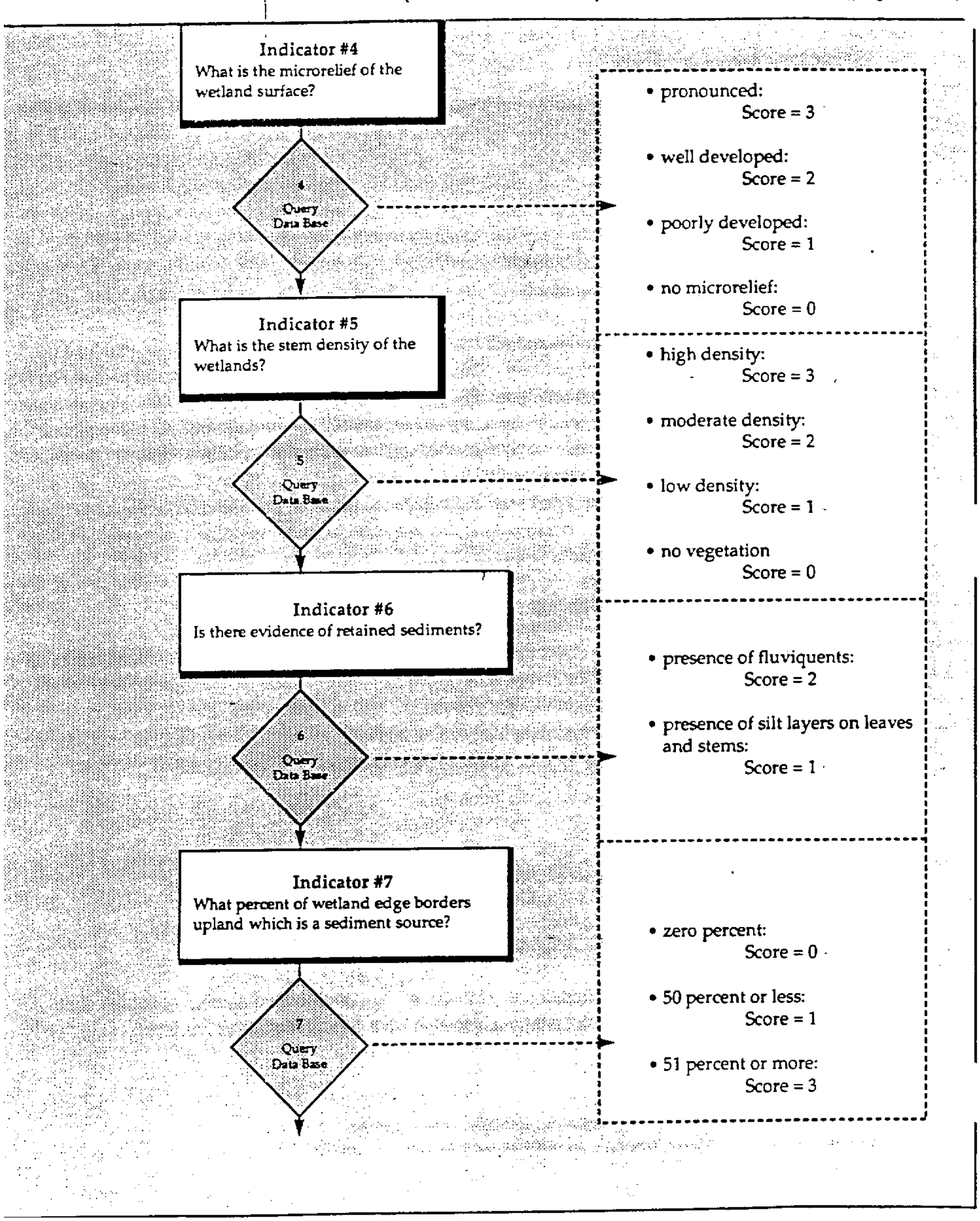
SEDIMENT STABILIZATION FUNCTION MODEL

(FIELD METHOD)



Source: (Fugro East 1995)

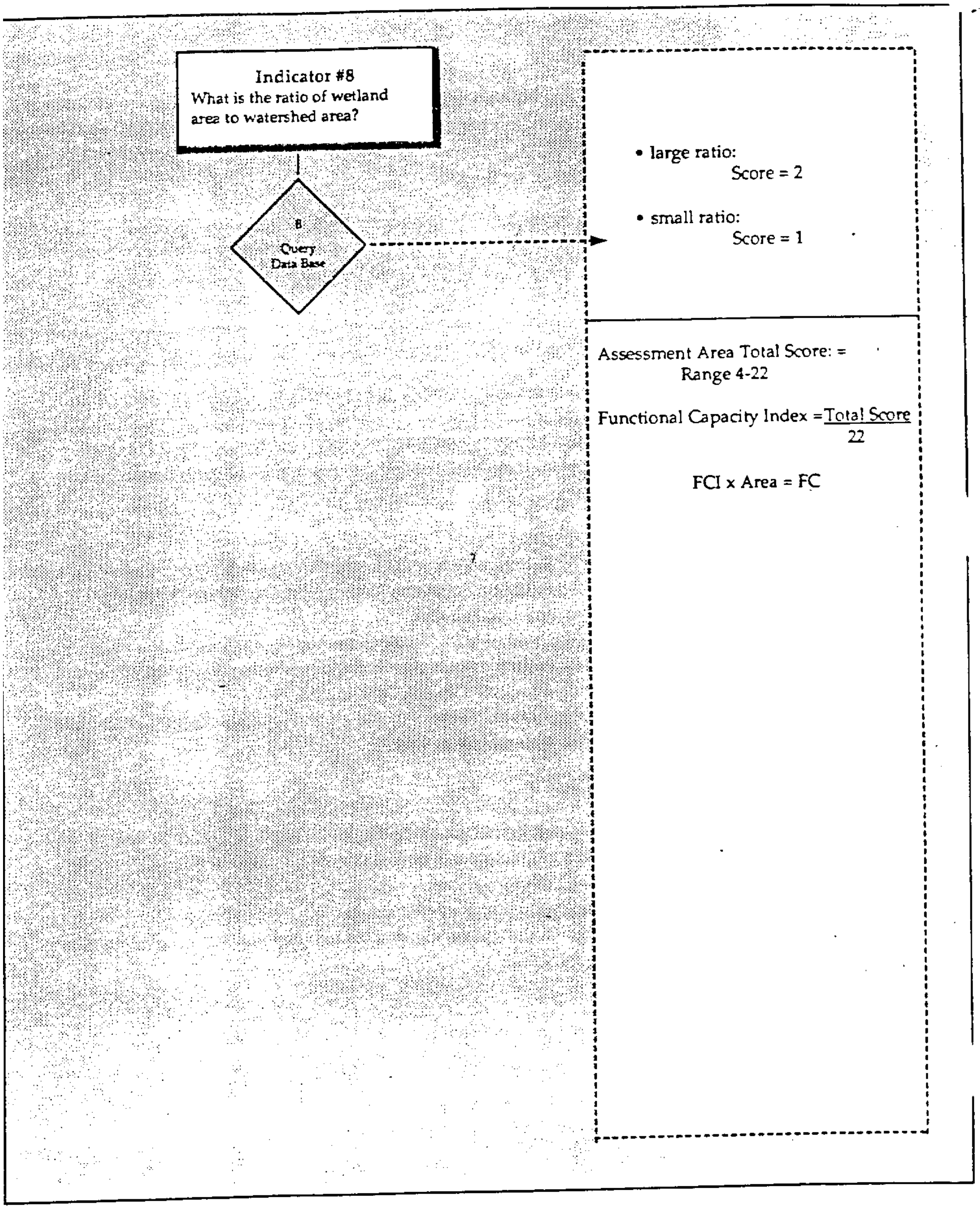
FIGURE 22
SEDIMENT STABILIZATION FUNCTION MODEL
(FIELD METHOD)



Source: (Fugro East 1995)

FIGURE 22
SEDIMENT STABILIZATION FUNCTION MODEL
(FIELD METHOD)

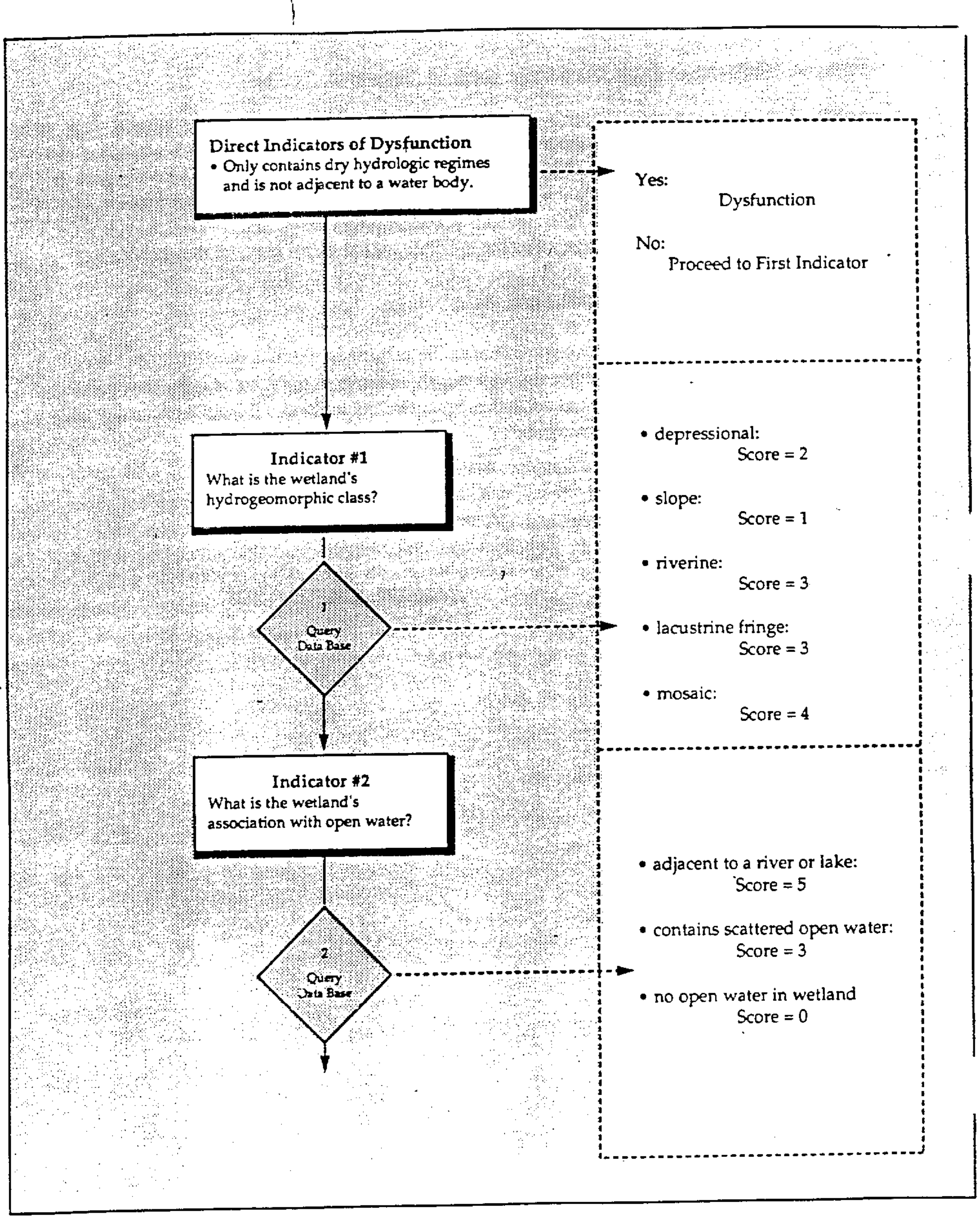
(page 3 of 3)



Source: (Fugro East 1995)

FIGURE 23

AQUATIC DIVERSITY/ABUNDANCE MODEL (FIELD METHOD) (page 1 of 6)



Source: (Fugro East 1995)

Soil Type

Soil type plays an important role in this function because of the chemical reactions that take place in the soil and at the soil, water, vegetation interface. Condition scores can vary from 3 for a type characterized by a high density of chemically reactive surfaces, such as a histosol (organic soil) or a mineral hydric soil with a high clay component, to a 1 for soil with a high proportion of sand. An intermediate condition would receive a score of 2.

Hydrogeomorphic Class

The geomorphology of the wetland basin controls the water flow vectors, hydrodynamics and interaction of water with wetland processes occurring in the wetland's water column regime, soil regime and vegetation regime.

Range of Conditions:

- **Depressional wetlands** predominating maximum water residency time, allowing for maximum interaction and are assigned a score of 4.
- **Riverine wetlands** are frequently inundated by overbank flooding and include certain vegetation, soils and natural valley flood storage conducive to processes which modify water quality. They are assigned a score of 3.
- **Mosaic wetlands**, because of their flatness, also induce interactions and are also assigned a score of 3.
- **Lacustrine fringe** wetlands generally flood less frequently and are assigned a score of 2.
- **Slope wetlands** retain and detain water less than other hydrogeomorphic classes and are assigned a score of 1.

Source: (Fugro East 1995)

Hydrogeomorphic Class

The wetland's geomorphology has a major influence on the hydrodynamics of the water which passes through the wetland.

Range of Conditions:

- **Depressional wetlands**, because of their shape and general lack of flow through hydrology and outlets, perform sediment stabilization by trapping the sediment within their basin and are assigned a score of 5.
- **Lacustrine fringe** wetlands are predominantly nearly flat and their surface is controlled by the adjacent lake's water plain. They are predominately densely vegetated and serve as excellent sediment traps and are assigned a score of 4.
- **Riverine wetlands** are associated with flood plains, where they are periodically inundated with flood water which typically contains sediment. The riverine wetland vegetation creates roughness which slows water allowing for sedimentation to occur. Floodplains are also areas where the hydrology is dynamic and flood water may erode sediment and prevent stabilization. Therefore, riverine wetlands are given a score of 3.
- **Mosaic wetlands** are generally broad flat wetlands containing riverine, lacustrine fringe and depressional wetland subareas. They are assigned a score of 3.
- **Slope wetlands** do not store flood water and lack the sedimentation function of the other wetland types. They do offer roughness to through-flowing sediment rich water, which results in a limited sediment stabilization function, and they are assigned a score of 1.

Frequency of Overbank Flooding

Overbank flooding is the transport mechanism by which sediments from streams enter floodplain wetlands. This function primarily relates to riverine wetlands, but lacustrine fringe wetland receive flood water from the lake. Mosaic wetlands generally contain floodplains, and occasionally so do depressional wetlands. Those wetlands with a high frequency of overbank flooding are assigned a score of 2, those with low frequency a 1. Wetlands that do not flood are assigned a zero.

Range of Conditions:

High Frequency:	< 5 years
Moderate Frequency:	6 to 20 years
Low Frequency:	> 20 years to 100 years

Field Evidence of Flooding:

A. Direct Observation
B. Watermarks/Silt marks on tree trunks
C. Scouring
D. Debris Deposition

Potential of Overland Flows From Surrounding Uplands

Another source of sediment rich water to the wetland is runoff from the surrounding upland. Those upland areas surrounding the wetland which have a high potential are assigned a score of 2, those with a low potential a 1.

Range of Conditions:

High Potential:	> 100 acres of upland contributing to overland flow
Low Potential:	100 or less acres of upland contributing to overland flow

Source: (Fugro East 1995)

Microrelief of Wetland Surface

Microrelief adds to the roughness of the wetland surface, slowing down flood water and trapping sediment within the pools of the mound and pool microtopography. Pronounced microrelief performs this process the best and is assigned a score of 3, well developed a 2, and poorly developed a 1. No microrelief is assigned a zero.

Range of Conditions:

Pronounced:	> 45 cm
Well Developed:	15-45 cm
Poorly Developed:	<15 cm

Stem Density

Vegetation stems offer resistance to through-flowing flood waters carrying sediment and adds to the roughness of the wetland surface. This slows down water allowing sedimentation. Fine grained sediment is deposited downstream of dense vegetation. New vegetation holds the trapped sediment in place preventing erosion and resuspension of the sediment. High stem density is assigned a score of 3, low a 1.

Range of Conditions:	***Definitions:***
• **High**	**High Density:** Stem density in the form of woody or emergent vegetation that covers the entire wetland with little/no open water or bare ground surface present.
• **Low**	**Low Density:** Stem density in the form of woody or emergent vegetation that is sparsely distributed throughout the wetland due to large amounts of open water or bare ground surface.
• **Moderate**	**Moderate Density:** Stem density whose distribution pattern is between the low and high conditions.

Evidence of Retained Sediment

Silt covered leaves, silt rings on stems, and silt shadows downstream of stems and dense stands of vegetation indicate that sedimentation is occurring. These indicators are assigned a 1. Fluviquents are soils which form from numerous sedimentation events on floodplains. They not only illustrate that process occur in the wetland which induce sedimentation, but that the sediment accumulates over years to produce the fluviquent soil and the sediment is stabilized for the long-term. The presence of fluviquent soils is assigned a 2.

Source: (Fugro East 1995)

Percent of Wetland Edge Bordering Upland Sediment Source

Sediment may enter a wetland carried by runoff from adjacent upland. Some upland, such as agricultural land may be a sediment source. The wetland can trap this inflowing sediment. The amount of wetland edge bordering erodible upland influences how much sediment a wetland may trap. If 51 percent or more of the wetland edge borders erodible upland then a score of 3 is assigned. If 50 percent or less of the wetland edge borders erodible upland then a score of 1 is assigned. If none of the wetland edge borders erodible upland then a score of zero is assigned.

Ratio of Wetland Area to Watershed Area

The amount of sediment entering a wetland may be influenced by its watershed size. All other characteristics being equal, the larger the wetland, the more opportunity to trap sediment, and the larger the watershed, the more potential sediment enters the wetland. A large ratio is assigned a score of 2, a small ratio is assigned a score of 1.

Range of Conditions:
Large ratio: >10%
Small ratio: <10%

$$\textbf{Ratio} = \frac{\textbf{wetland area}}{\textbf{watershed area}} \times 100$$

Source: (Fugro East 1995)

Wetland Rapid Assessment Procedure (WRAP)

Source: (Miller and Gunsalus 1999)

Wetland Rapid Assessment Procedure

☐ Existing Conditions ☑ Check one ☐ Proposed Conditions

(WRAP)

Application Number	Project Name	Date	Evaluator	Wetland Type

Land Use	FLUCCS Code	Description:	Wetland Acreage

Wildlife Utilization (WU)	Wetland Canopy (O/S)	Wetland Ground Cover (GC)

Habitat Support / Buffer

Buffer type	(Score)	X (% of area)	=Sub Totals
		TOTAL	

Field Hydrology (HYD)	WQ Input & Treatment (WQ)*

* The value of WQ is obtained by adding the TOTAL scores of Land use Category and Pretreatment category then dividing by 2

Land use Category (LU)

Land use Category	(Score)	X (% of area)	=Sub Totals
		(LU) TOTAL	

Pretreatment Category (PT)

Pretreatment Category	(Score)	X (% of area)	=Sub Totals
		(PT) TOTAL	

WRAP Score

Field Notes:

Wildlife Utilization (WU)

Wetland Canopy (O/S)

Wetland Ground Cover (GC)

Habitat Support / Buffer

Field Hydrology (HYD)

WQ Input & Treatment (WQ)

Source: (Miller and Gunsalus 1999)

2.2.2.2 WETLAND OVERSTORY/SHRUB CANOPY RATING INDEX

Objective

The wetland overstory/shrub canopy variable is a measure of the health and appropriateness of the wetland shrub and overstory canopy. The assessment of the canopy variable is objectively evaluated based on food resources, cover, nesting potential, and appropriateness of the vegetative community. The canopy stratum is evaluated based on the habitat type. This variable may not be applicable to freshwater marsh and wet prairie habitats where overstory/shrub canopy is typically not present (less than 20%). By definition, undesirable plant species include exotic and nuisance plant species.

Score

NO DESIRABLE WETLAND OVERSTORY/SHRUB CANOPY TREES PRESENT — 0

- No desirable wetland trees or shrub species.
- Negligible or little habitat support (i.e., roosting, nesting and foraging) from seedling trees (if present).
- Site subject to recent clear cutting with no evidence of native canopy plant regeneration.
- Greater than 75% undesirable plant species (including E&N species).

MINIMAL DESIRABLE WETLAND OVERSTORY/SHRUB CANOPY TREES PRESENT — 1

- Large amounts (approx.. 50%) of undesirable tree or shrub species.
- Wetland overstory/shrub canopy immature but some potential for habitat support.
- Minimal signs of natural recruitment of native canopy and shrub seedlings, or tree coppicing.
- Few snags, or if many present, it may be an indication of hydrology problems or environmental impacts.
- Disease or insect damage in live canopy trees.

MODERATE AMOUNT OF DESIRABLE WETLAND OVERSTORY/SHRUB CANOPY TREES PRESENT — 2

- Few (less than 25%) undesirable canopy trees/shrubs.
- Wetland overstory/shrub canopy is providing habitat support.
- Some evidence of natural recruitment of native canopy/shrub seedlings, or tree coppicing.
- Few snags or den trees.
- Healthy live canopy trees with minimal evidence of disease or insect damage.

ABUNDANT AMOUNT OF DESIRABLE WETLAND OVERSTORY/SHRUB CANOPY TREES PRESENT — 3

- No exotic and less than 10% invasive canopy/shrub species present.
- Good habitat support provided by wetland overstory/shrub canopy.
- Strong evidence of natural recruitment of native canopy and shrub seedlings.
- Few snags or den trees.
- Healthy live canopy trees with minimal evidence of disease or insect damage.

Source: (Miller and Gunsalus 1999)

Freshwater Mitigation Quality Assessment Procedure

(WMQA)

Source: (Balzano et al, 2002)

C. VEGETATION COMPOSITION/DIVERSITY –

C.1 OVERSTORY (TREE AND SHRUB) LAYER

Objective:

The vegetation composition/diversity - overstory layer variable evaluates the presence, health, and abundance of the wetland's tree and shrub layer 3 feet or more in height, where applicable. Desirable plant species are those plants that one would expect to see in a comparable undisturbed wetland and those that do not have a tendency to become invasive. Undesirable plant species are plant species that are not usually considered nuisance species, however may be indicative of other problems (i.e. - improper hydrology) and may dominate a particular stratum. Nuisance or invasive plant species have the potential to dominate plant communities (e.g. tree-of-heaven, multiflora rose, Russian olive). This variable is not applicable to emergent habitats where overstory layers are typically not present. In this case a score of NA (not applicable) should be noted on the field data sheets. (Note - Overstory trees >15' height, Shrub = >3-15' height).

Refer to Appendix A - list of plants defined by NJDEP to be "nuisance or invasive" species.

	Relative Score:
ABUNDANT AMOUNT OF DESIRABLE WETLAND OVERSTORY LAYER PRESENT	3

a. **Abundant** wetland overstory layer present (75-100% cover).
b. Wetland contains negligible nuisance or invasive trees and shrubs **(<1%).**
c. **Strong** evidence of natural recruitment of desirable tree and shrub seedlings.
d. **Abundant** signs of recent growth.
e. **Negligible** evidence of insect damage and/or herbivory.
f. **Negligible** signs of abnormal growth patterns, chlorosis, or other abnormalities.
g. **High** tree and shrub diversity.

MODERATE AMOUNT OF DESIRABLE WETLAND OVERSTORY LAYER PRESENT	2

h. **Moderate** wetland overstory layer present (50-74% cover).
i. Wetland contains minimal nuisance or invasive trees and shrubs **(1-10%).**
j. **Moderate** evidence of natural recruitment of desirable tree and shrub seedlings.
k. **Moderate** signs of recent growth.
l. **Minimal** evidence of insect damage and/or herbivory.
m. **Minimal** signs of abnormal growth patterns, chlorosis, or other abnormalities.
n. **Moderate** tree and shrub diversity.

Source: (Balzano et al, 2002)

C. 1 OVERSTORY (TREE AND SHRUB) LAYER (continued)

	Relative Score:
LIMITED AMOUNT OF DESIRABLE WETLAND OVERSTORY LAYER PRESENT	1

o. **Minimal** wetland overstory layer present (25-49% cover).
p. Nuisance or invasive trees and shrubs are well-established (**>10-50%**).
q. **Minimal** evidence of natural recruitment of desirable tree and shrub seedlings.
r. **Minimal** signs of recent growth.
s. **Moderate** evidence of insect damage and/or herbivory.
t. **Abundant** signs of abnormal growth patterns, chlorosis, or other abnormalities.
u. **Minimal** tree and shrub diversity.

UNDESIRABLE WETLAND OVERSTORY LAYER PRESENT	0

v. **Negligible** wetland overstory layer present (0-24% cover).
w. Wetland is dominated by nuisance or invasive trees and shrubs (**>50%**).
x. **Negligible** signs of natural recruitment of desirable tree and shrub seedlings.
y. **Negligible** signs of recent growth.
z. **Strong** evidence of insect damage and/or herbivory.
aa. **Extensive** signs of abnormal growth patterns, chlorosis, or other abnormalities.
bb. **Negligible** tree and shrub diversity.

Source: (Balzano et al, 2002)

IV. Scoring Matrix - See introduction for instructions on how to apply these guidance field indicator lists. Letters for these field indicators correspond to Section III which should be used to assign a value based on the "best fit" method.

A. HYDROLOGY

Relative Score	Wetland Hydrology	Undesirable Plant Colonization	Plant Stress	Plant Mortality	Surface Inundation	Water Flow Channelization	Redoximorphic Features	Hydric Soils
3	a. adequate	b. negligible	c. no stress	d. negligible	e. abundant	f. negligible	g. distinct	h. strong
2	i. impaired	j. minimal	k. minimal	l. minimal	m. moderate	n. minimal	o. present	p. moderate
1	q. inadequate	r. moderate	s. moderate	t. moderate	u. minimal	v. moderate	w. minimal	x. minimal
0	y. limited	z. extensive	aa. severe	bb. extensive	cc. absent	dd. extensive	ee. absent	ff. negligible

B. SOILS

Relative Score	Topsoil	Erosion	Soil Compaction	Debris
3	a. >6"	b. negligible	c. negligible	d. negligible
2	e. 3-6"	f. minimal	g. minimal	h. minimal
1	i. present, up to 3"	j. moderate	k. moderate	l. moderate
0	m. absent	n. strong	o. strong	p. extensive

C.1 VEGETATION COMPOSITION/DIVERSITY - OVERSTORY (TREE AND SHRUB) LAYER

Relative Score	Plant Cover	Invasive Plants	Natural Recruitment	Plant Growth	Insects & Herbivory	Plant Stress	Diversity
3	a. abundant	b. <1%	c. strong	d. abundant	e. negligible	f. negligible	g. high
2	h. moderate	i. 1-10%	j. moderate	k. moderate	l. minimal	m. minimal	n. moderate
1	o. minimal	p. >10-50%	q. minimal	r. minimal	s. moderate	t. abundant	u. minimal
0	v. negligible	w. >50%	x. negligible	y. negligible	z. strong	aa. extensive	bb. negligible

C.2. VEGETATION COMPOSITION/DIVERSITY - GROUND COVER

Relative Score	Plant Cover	Invasive Plants	Natural Recruitment	Plant Growth	Insects & Herbivory	Plant Stress	Diversity
3	a. abundant	b. <1%	c. strong	d. abundant	e. negligible	f. negligible	g. high
2	h. moderate	i. 1-10%	j. moderate	k. moderate	l. minimal	m. minimal	n. moderate
1	o. minimal	p. >10-50%	q. minimal	r. minimal	s. moderate	t. abundant	u. minimal
0	v. negligible	w. >50%	x. negligible	y. negligible	z. strong	aa. extensive	bb. negligible

Source: (Balzano et al, 2002)

IV. Scoring Matrices (continued)

D. WILDLIFE SUITABILITY

Relative Score	Cover	Adjacent Resources	Human Impediments	Nest/Breeding Activity
3	a. abundant	b. abundant	c negligible	d. strong
2	e. adequate	f. available	g. minimal	h. moderate
1	i. limited	j. limited	k. moderate	l. minimal
0	m. inadequate	n. inadequate	o. extensive	p. inadequate

E. SITE CHARACTERISTICS

Relative Score	Maintenance	Edge:Area Ratio	Heterogeneity	Location	Size
3	a. stable	b. low	c. distinct	d. conducive	e. conducive
2	f. some	g. moderate	h. moderate	i. adequate	j. adequate
1	k. extensive	l. high	m. low	n. impedes	o. impedes
0	p. continuous	q. extreme	r. none	s. inadequate	t. inadequate

F.1. LANDSCAPE CHARACTERISTICS - ADJACENT BUFFER

Relative	Width	Invasive Species	Wildlife Suitability	Cover	Slope
3	a. ≥150.	b. <1%	c. predominantly	d. adequate	e. <10%
2	f. >50-<150 ft.	g. <50%	h. some	i. limited	j. 10-20%
1	k. ≤50 ft.	l. >50%	m. limited	n. inadequate	o. >20%
0	p. 0 ft.	q. not applicable	r. not available	s. not available	t. not available

F.2 LANDSCAPE CHARACTERISTICS - CONTIGUITY

Relative Score	Contiguity
3	a. 75-100%
2	b. 50-<75%
1	c. 25-<50%
0	d. <25%.

F.3 LANDSCAPE CHARACTERISTICS – LAND USE

Land Use (Score shown in parenthesis)	
a. undeveloped open space (3)	f. agriculture (1)
b. low density residential (2)	g. highway (0.5)
c. low intensity commercial (1.5)	h. industrial (0.5)
d. high-density residential (1)	i. high intensity commercial/industrial (0)
e. recreation/golf courses (1)	

Source: (Balzano et al, 2002)

Appendix D:

Operational Strengths and weaknesses of the functional assessment methods implemented in WMA 6

Operational strengths and weaknesses of the individual methods:

We provide points for strengths and weaknesses that we encountered for each method from the perspective of implementation and interpretation of the method. We also provide recommendations on how the methods may need to be further modified to be applicable in New Jersey, as well as revisions that we found would be useful from the perspective of increasing reliability between different evaluators and potentially across different wetland types.

Descriptive Approach

Strengths

- The indicators are straightforward, and the detail provided by listing all applicable indicators in the rationale column of the data sheet can be used to provide a detailed description of the wetland.
- The method is very flexible, allowing the evaluator to add or weight indicators as appropriate, thus allowing the method to be applied to any wetland type. This also allows the evaluator room for individual interpretation at unusual sites.
- The documentation for the method provides a good definition of the functions assessed in this method.
- The documentation provides a nice example of a graphical approach that can be used to summarize assessment information for many wetlands in the same geographic area, but this requires taking the evaluations from the field into the office and further refining the information. While this might be appropriate and informative for a larger spatial context, it could become burdensome for individual wetlands.

Weaknesses

- Due to the subjective and binary nature of evaluating wetlands with this method, it is particularly important that people who use this method have breadth and depth in wetland ecology and that it relies on team consensus rather than a single evaluator.
- The procedure lacks adequate guidelines to help the evaluator determine principal functions.
- The legwork required prior to fieldwork is time-consuming, as a great deal of data is required and some of it can be difficult to locate or unavailable.
- The lack of any sort of ranking method in the Descriptive Approach makes it difficult to compare a large number of wetlands and time-consuming to compare even a small number in a meaningful way.
- The method provides limited information regarding degree of wetland functioning, particularly compared to the other methods.
- Some of the indicators show positive functioning in the wetland, while others show a lack of functioning. The positive and negative indicators are not separated in the lists or data sheets. This is problematic, especially when one needs to sort through a long list of indicators that apply to each function.
- The method is not particularly rapid when the suggested indicators are used due to the long lists of indicators and extensive legwork. In addition, there is

considerable upfront time collecting the materials necessary to implement the method (Table 6).

Modifications for New Jersey:
We did not identify any modifications that would be required to increase the suitability of the Descriptive Approach to New Jersey wetlands. The documentation provides support for using a presence/absence method rather than rating the degree of functioning:

- Using ratings (high, moderate, low) can imply a more quantifiable database than actually exists.
- Numerical rankings are absolute and should be avoided unless data can support the analysis. In any case, arbitrary weightings should not be applied to functions, and dissimilar functions should not be ranked together.

Based on our experience with this method and binary (yes/no) responses, it is critically important that the methodology be clearly and concisely documented and the indicators be clearly defined, described and organized. Clear instructions on how principle functions are to be identified is necessary to ensure repeatability across different teams and wetlands.

Wetland Evaluation Technique (WET)

Strengths

- A glossary is provided, which helps clarify terminology used in the method.
- Instructions are detailed and complete.
- Figures are often provided to help clarify the methodology questions.
- Detailed information is provided for each function in the Effectiveness and Opportunity evaluations, including definition and description of the function, rationale for ratings, general sensitivities of the interpretation key and interpretation key to determine ratings.
- A computer program has been developed to determine the ratings for the Effectiveness and Opportunity evaluations, thereby eliminating the long, time-intensive interpretation keys, and possibly reducing the time required to complete a site evaluation.
- Detailed keys are provided to guide the delineation of the assessment area.
- A list of the indicators is provided in an appendix, along with information regarding which functions each indicator is used in.

Weaknesses

- The method is long and tedious. This prevents it from being particularly rapid. There are many detailed questions required for each assessment and the interpretation keys (especially for the effectiveness evaluation) are very long and tedious.
- The method requires a lot of information gathering prior to site visits.
- The social significance (Level 1) evaluation does not provide a rationale for ratings.

- The evaluator must determine if the service area is covered by more than 10% impervious surface. A consistent interpretation of landuse maps is necessary to ensure consistency between evaluators.

Modifications for New Jersey:

We did not identify any modifications that would be required to increase the suitability of WET to New Jersey wetlands.

Rapid Assessment Methodology for Evaluating Wetland Functional Values (WI RAM)

Strengths

- The method provides a list of special features or "red flags" that are not incorporated into the ratings for functions, but that are included on the summary sheet for consideration along with the ratings for each function. This allows evaluators to call attention to any unique or important features that may influence decisions about the wetland. However, these "red flags" are not until page 5 of the document and may not be adequately recognized by someone looking at the results. A more prominent place on or near the ratings results (which is on page 1) could help ensure that these special features are recognized if they are present.
- A place is given to describe any seasonality limitations of the wetland evaluation due to the time of year, and/or current hydrologic or climatologic conditions (i.e. drought, spring flood). This may help explain conditions that may affect ratings causing unusual or inconsistent results.
- The data sheet is clear and easy to understand.

Weaknesses

- This method provides few instructions or guidelines, which increases the subjectivity of the results and reduces the confidence of the evaluators in the ratings.
- The method provides a list of questions, primarily yes/no questions, for each wetland function, but does not provide guidelines for turning the answers to these questions into a rating (of low, medium, high, or exceptional) for the function. This leaves a great deal to the judgment of the evaluator and decreases the precision of the method.
- The Floral Diversity function has a list of only two questions. Evaluators had difficulty determining how to choose among four possible ratings (low, medium, high, and exceptional) based on the answers to only two questions and felt that more questions were needed.
- Usually an answer of yes for any given question indicated that the site was functioning in some way, but for a few questions, which were dispersed among the others, an answer of yes indicated a lack of functioning. This also made it difficult for evaluators to look through the list and determine an overall rating for the function. These questions should be reworded or separated to reduce confusion.

- Groundwater Discharge/Recharge would also benefit from an increase in the number of questions, as only three are listed. Additionally, the second and third questions are unclear and require definitions of terms or examples.
- Evaluators expressed lower than average confidence in the answers to yes/no questions, as the questions did not account for "gray areas" or unusual situations.
- No rationale is given in the documentation for the development of the method or the indicators used in determining the ratings.
- In general we had less confidence in the Floral Diversity and in the Groundwater Recharge/Discharge functions. Floral Diversity only had 2 questions that had the same answers for each wetland, yet the evaluators did not feel that all wetlands deserved the same rating, so best professional judgment was employed to make a rating decision. This can lead to greater differences between different evaluators. It was difficult to determine a rating of low, medium, high, or exceptional from such little input. The Groundwater Recharge/Discharge function only has 3 questions and evaluators were not clear on what specifically to look for in two of the three questions. It was also difficult to determine a rating for this function with so few questions.

Modification for New Jersey

Some information within the text should be modified to increase the suitability of WI RAM to New Jersey wetlands. This includes a list of wetland types in New Jersey, a list of critical habitats and species for New Jersey in the evaluation of red flags, locations of wetlands that are particularly sensitive or targeted for conservation, and reference to New Jersey Natural Heritage Program and the NJ Endangered and Nongame Species Landscape Project. The method should also be updated to incorporate New Jersey coastal laws (Wisconsin includes their coastal management laws) if it is used for this area. Wetland regulations that are specific to New Jersey should replace those specific for Wisconsin in the methodology.

Technique for the Functional Assessment of Nontidal Wetlands in the Coastal Plain of Virginia (VIMS)

Strengths

- The method documentation provides information regarding the method's purpose, wetland types for which its use is appropriate, and limitations of the method. It also provides good support for their choice of wetland type (i.e. why it is important to evaluate nontidal coastal plain wetlands in VA).
- A short literature review of wetland assessment methods is given that provides some background for the method's development.
- Method documentation provides good background information regarding each of the wetland functions, including definitions, characteristics that affect the effectiveness of a wetland to perform a function, review of how other assessment methods evaluate the function, rationale and references for selected indicators and for the rating thresholds, description of each indicator and its ratings, and rationale for the dichotomous key that is used to determine the overall rating for

the function. This level of detail facilitates future users if they find they need to modify the method.

- The questions are clear and straightforward. There are few questions with ambiguous wording or lack of instructions. In some cases, guidelines are given for questions to help reduce their subjectivity.
- There are separate data sheets for the office and the field. The separate data sheets helped evaluators to easily identify questions that needed to be answered in the office from those that required a field assessment.

Weaknesses

- No information is given regarding the qualifications, training, or the level of expertise the evaluators should possess.
- In two different locations within the manual, there are two sets of directions for determining the overall rating for each function: a written set and a dichotomous key. The written description is not explicit for some functions, using terms such as "most," and, if used instead of the dichotomous key, this description could lead to erroneous scoring if the inexplicit directions are interpreted differently than as laid out by the key.
- Likewise, there are multiple, overlapping data sheets, which can be awkward and confusing. This system should be simplified to decrease overlap and shorten the amount of time required to perform the method by decreasing the number of sheets that need to be filled out.
- The calculation for the proportion of a 2-year, 24-hour flood volume stored in the wetland did not work well for our wetland sites in WMA 6 (this indicator is used in the flood storage, nutrient retention, and sediment/toxicant trapping functions). The wetlands were located within large wetland complexes along the Passaic River. As such, the primary sub-watershed (which discharges directly into the wetland without the water passing through other wetlands first) was very small compared to the upstream sub-watershed (which discharges into the wetland with water traveling through other wetlands first). Because the majority of the runoff in the wetland's watershed is captured by other wetlands first during a storm event, the amount of runoff that reaches the wetland is low. However, because the wetlands are floodplains, they have a relatively high storage capacity. This combination of low amounts of runoff reaching the wetland and a high storage capacity resulted in numbers greater than 1 for the calculation for the proportion of a 2-year, 24-hour flood volume stored (more than 100% of the volume can be stored in the wetland). However, the method documentation states that this number should be a number between 0 and 1. This was not a problem in WMA 19 where less of the site's watershed was comprised of wetlands.

Modification for New Jersey

The calculation for the proportion of a 2-year, 24-hour flood volume stored in the wetland may not be applicable for floodplain wetlands, as it does not address overbank flooding from the river as a source of hydrology to the wetland during a storm event. Only surface runoff from the surrounding watershed is calculated into the final determination.

Guidance for Rating the Values of Wetlands in North Carolina (NC Guidance)

Strengths

- It is important that evaluators keep in mind that NC Guidance assesses a wetland's value to human society, and not specific wetland functioning, when comparing wetlands with different overall wetland rating scores.
- The method is straightforward and easy to apply in the field. Implementation required little gathering of data sources and little field preparation.
- A narrative description is included for each wetland function, which provides text for clarification on wording or the meaning of the flowcharts. The narrative description includes: function definition, rationale for the scoring criteria, why specific indicators were used and how they affect scoring of the function.
- Data sheets were clear and concise. Instructions are accompanied with flowcharts, which facilitate moving through the calculations to the final wetland score.
- The method explains how to follow flowcharts and what to do in cases where the flowchart is not applicable for a particular wetland.
- A glossary is included in the documentation for NC Guidance, which helps to clarify terminology used in the flowcharts for the method.
- The NC Guidance rating system was developed from a literature review of biological criteria (DEHNR 1993). An appendix is included in the method documentation that provides citations for the indicators that were chosen to evaluate each function. This information is useful if modifications to the method are desired.

Weaknesses

- Due to the rapidness of this method, less field and data input is required, which may reduce the accuracy of the scores.
- There is no justification for the weightings that are used for the different functions, so it is difficult to evaluate if they are appropriate or if they need to be adjusted for New Jersey. Errors made in determining the scores are amplified when they are multiplied by the weightings for each wetland function, especially for the Pollutant Removal wetland function due to its high weighting. This can potentially alter the overall Wetland Rating and reduce consistency among evaluators.
- Degree of microtopographic relief (water storage, pollutant removal). The evaluator must determine whether more than 50% of the wetland area consists of depressions greater than 10 inches, between 5 and 10 inches, or less than 5 inches. It can be difficult to accurately determine the size of depressions if they are over 50% of the wetland area in very large wetlands.
- Land use within the watershed (bank/shoreline stabilization). The evaluator must determine if there is greater than 10% impervious surface within ½ mile upstream from the wetland. There are no instructions on how to determine this number. Different evaluators using different methods to estimate the percent of impervious surface could lead to inconsistencies in the wetland evaluation.

- Flooding frequency (pollutant removal). The evaluator has to determine whether a 2nd or higher order stream floods seasonally or temporarily. This requires a working knowledge of the hydrology of the area. The distinction between these two flooding frequencies is important, since errors in selecting the correct flooding frequency can cause large discrepancies between ratings due to the high weighting of this function.

Modification for New Jersey

Some information within the text should be modified to increase the suitability of NC Guidance to New Jersey wetlands. For example, tables listing common plant species preferred by waterfowl or wildlife should be modified with plant species commonly used by waterfowl and wildlife in New Jersey. A list of rare plant species for New Jersey would substitute the current list for rare plants in North Carolina. In addition, some indicators were not clearly defined and could lead to inconsistencies in the ratings. These indicators were mainly within the water storage, bank/shoreline stabilization, and pollutant removal functions.

MDE:

Strengths

- MDE has the best overall description of the functions and the indicators of all the methods we tested. In particular, the information regarding inventory methods and the figures for each indicator helped to clarify what to look for in the office and in the field. As a result, evaluators were confident in their abilities to accurately evaluate the indicators for the method.
- The directions for applying the method are also clear and well explained. The method includes explicit guidelines on how to use the results to obtain a score for the wetland, thus reducing the number of judgment calls required to obtain a score. Detailed instructions and criteria are provided for the definition of assessment area boundaries, including figures and special cases (i.e., wetland mosaics).
- Two versions of the method are included: a field method and a desktop method, which does not require field work. The desktop method may be useful in some situations; however, the document itself warns that this method may not be as accurate as the field method. Thus, there are situations in which its use would not be appropriate.
- There are a large number of indicators that influence the score for each function. This makes the method both more comprehensive and less prone to large variations in scores due to errors in scoring individual indicators. The indicators are also weighted to allow more important factors to influence the score more heavily. The only indicator that may drastically affect scores if computed improperly is area, which has an inordinately large, multiplicative weighting on the final score.
- The document also includes a literature review and justification for choosing the functions and indicators that were included.

- Method documentation provides information regarding specific utilizations and limitations of the method.

Weaknesses

- Area has an inappropriately large effect on the overall score. The score for each of the six functions is multiplied by the area of the site prior to being summed, giving area an inordinately large effect on the overall score. In addition, using area as a multiplier causes the scores for the quality of site functionality to be lost in the measurement of quantity of functionality.
- The indicators are listed in different orders on the data sheets than they are in the text. This makes it difficult to look up information if questions arise concerning terminology, etc.
- There is no summary data sheet on which to calculate the overall site score.
- The definition of intermittent outlet was difficult to apply in floodplains wetlands such as the ones we evaluated in this study.
- Evaluators found it difficult to determine whether surficial geological deposits had high or low permeability.
- Nested piezometer data is listed as an indicator for the ground water discharge function, however this information is very time and labor intensive for a rapid assessment method, as it requires the installation of ground water monitoring wells. The method documentation states that this information is rarely available, but does not provide any guidelines as to how to adjust the scoring if this information is not available.

Modification for New Jersey

- Some information within the text needs modification to increase the suitability of MDE to New Jersey wetlands. For example, in the Aquatic Diversity function, some steps in determining the score for the function did not have appropriate choices for the wetlands examined in this study. Steps 3 and 5 do not include options appropriate for drier regimes, such as those found in floodplains. Step 17 in the Aquatic Diversity function, which deals with special areas of concern on the Chesapeake Bay, should be adjusted to account for special areas of concern in New Jersey or could be dropped and the maximum score for the function adjusted downward.
- Information is provided regarding Maryland GIS data layers that are available, including the name, relevance to the method, how to obtain it, and which are the most accurate. Equivalent information for New Jersey would be appropriate.

Freshwater Wetland Mitigation Quality Assessment Procedure (WMQA)

Strengths

- Scoring is flexible. Additional indicators may be included with those discussed in the manual, and the evaluator may assign greater weight to indicators that are more important at given sites. The evaluator may also assign scores in increments of 0.5 as deemed appropriate.

- The method was designed to assess the potential of mitigated wetland sites to function properly as wetlands. Results from relatively pristine, natural sites are high compared to those at most mitigation sites, demonstrating that the method successfully picks up functioning when it is present (Hatfield et al. 2003).
- The method is reasonably straightforward, making it easy to apply in the field.
- The method is also reasonably objective and relies less on professional judgment than do several of the other methods examined in this report.
- Evaluators found the method easy to apply and were confident in their abilities to accurately evaluate the indicators for each function.
- Method documentation provides background information regarding the development of the method and its purpose.
- A definition is provided for each wetland function, as well as a short discussion regarding the indicators for each function and what to look for in the field.

Weaknesses

- The method's writers assume that evaluators are experienced in wetland identification, delineation, and mitigation construction techniques, and that a pair of two evaluators will collaborate to score the wetland. This may not always be true or practical.
- Since the method was designed to measure the functional potential of mitigated sites, several indicators are designed specifically for mitigated sites and may be less appropriate for use with natural sites, including:
  - Soils: topsoil depth, erosion, or loss of topsoil (may not be appropriate for natural floodplain wetlands were erosion is natural) and evidence of soil compaction
  - Site Charateristics: degree of maintenance required to achieve and maintain wetland
- Soil erosion is expected in riverine, forested wetlands with overbank flow, yet WMQA scores sites with erosion lower for the soils function.
- The instructions for this method could use more detail and further definition of terms, both of which may decrease variability among evaluators.
- The same title "plant stress" is used for two separate indicators, one occurring in the hydrology function (where it refers to signs of improper hydration) and one in the vegetation function (where it refers to signs of improper nutrition). The use of separate terms would reduce confusion.
- It would also aid clarity if the hydrology indicator "undesirable plant colonization" were changed to something more specific, such as "transitional/upland plant succession," in order to avoid confusion with the vegetation function's "invasive plant colonization" indicator.

Modification for New Jersey

We did not identify any modifications that would be required to increase the suitability of WMQA to New Jersey wetlands.

Wetland Rapid Assessment Procedure (WRAP)

Strengths

- The method includes a glossary to ensure that all evaluators are interpreting terms in the same manner.
- The method includes several appendices, which detail information about different wetland types and which species or features you might expect to find there. This aids the evaluator in determining what he or she should look for.
- The questions are straightforward and the directions easy to follow, making the method easy to apply. This provided evaluators with higher confidence in their ability to accurately rate the wetlands.
- The method allows some leeway in rating sites, such as scoring in increments of 0.5, in order to account for situations that do not exactly fit the criterion listed within the method. This allows for intuitive ratings based on professional judgment, which lends flexibility to the method.
- The method is rapid compared to many of the other methods examined.
- When determining the effect of surrounding land uses, the method considers a wide range of land use types.
- The method is applicable to a range of different wetland types.

Weaknesses

- The description of how to calculate the score for the wetland buffer is confusing. The method documentation should state that the wetland buffer should be determined for the entire perimeter of the wetland, and as a result, that multiple buffer types are permitted for each wetland.
- Intended for use by regulatory professionals, the method relies on professional experience to aid in interpretation of field observations.
- The Wildlife Utilization function requires the evaluator to be familiar with the habitat requirements for all levels of the food chain. Furthermore, all wildlife habitat features may be difficult to identify within large wetlands.

Modification for New Jersey

Some information within the text should be modified to increase the suitability of WRAP to New Jersey wetlands. For example, the land use categories should be modified to reflect those found in New Jersey. One requirement for receiving a score of 3 for vegetative overstory cover and vegetative ground cover is that there be no exotic species present. It is difficult to find a wetland site in New Jersey with no exotic species. It may be appropriate to adjust the number of exotic species that one might expect to find at sites of different quality. Another requirement for a 3 under vegetative ground cover is that periodic burns should be present. This would not be appropriate for most New Jersey wetland types. Several appendices, which provide useful information, should be adjusted to reflect information appropriate to New Jersey.