

WETLAND ASSESSMENT FOR REGULATORY PURPOSES



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ASWM Background

Four-year series of studies of Wetland Assessment funded by EPA which resulted in the following reports available at <http://aswm.org/>:

- **Wetland Assessment in the Courts**
- **Wetland Functions and Values**
- **Integrating Wetland Assessment Into Regulatory Permitting**
- **Reconciling Wetland Assessment Techniques**

Supplemental research and writing funded by the McKnight Foundation which resulted in another report:

Assessing the Natural and Beneficial Functions of Floodplains

http://aswm.org/pdf_lib/nbf.pdf

- We have conducted a number of national symposia and workshops concerning wetland assessment (e.g., Portland, Maine; Annapolis, Maryland; Shepardstown, West, Virginia)

Content of Presentation

- **Why assess?**
- **What regulatory approaches have been taken to assessment of wetland functions and values? What have been the problems?**
- **What lessons have been learned? What are useful future directions?**

“Reality Continues to Ruin My Life”



Why Assess? A Wide Variety of Resource Protection and Restoration Programs Need Information Pertaining to the Functions and Values of Wetlands, Floodplains, Riparian Areas

– Regulations

- Federal (e.g., Section 404)
- State (e.g., wetland regulations, Section 401 reviews)
- Local (e.g., local zoning, subdivision controls, wetland ordinances)

– Restoration Projects (e.g., nonregulatory, regulatory (mitigation banks))

– Planning Efforts

- Watershed Plans, comprehensive land use planning, site-specific Plans **water projects**

– Federal, state, local

– Acquisition programs (e.g., Land Trust, State Park; Wildlife)

– Public land management programs, Planning Requirements, NEPA

– Miscellaneous

- Post and **predisaster** planning
- Floodplain **management**; FEMA Community Rating Program

Policies and Regulations Requiring Quantitative Assessment: “Measuring No Net Loss” of Wetland Function/Values

Authorized by: No net loss policy endorsed by President Bush, 1989; Memoranda of Understanding 1989 Between the Army Corps of Engineers and the Environmental Protection Agency; EPA Mitigation Guidance; Omnibus Water Bill; State and local wetland, floodplain, riparian regulations.

Content: This policy does not prohibit all wetland impacts but prohibits “net loss”. This focuses attention in wetland permitting upon assessment of functions/values to determine whether a net loss will occur and the adequacy of compensation measures such as restoration or creation.

“No Net Loss” and Analogous Regulatory Standards

- **No Net Loss Standard Contained in Wetland, Floodplain, Riparian Regulatory Policies At All Levels Of Government**
 - **Federal Wetland and Water Resources Section 404 Regulatory Requirements; Mitigation Guidance**
 - **State 401 Approvals, State Wetland Regulations**
 - **Local Zoning, Watershed, Wetland, Floodplain, Riparian Regulations**
- **Water Pollution Control Antidegradation Standards; “Restore and Maintain” the Chemical, Physical, and Biological Integrity of the Nation’s Waters**
- **Water Resources Development Act of 2007 Goal Of “ Protecting And Restoring The Functions Of Natural Systems And Mitigating Any Unavoidable Damage To Natural Systems ” Incidentally, new guidance pertaining to water resources projects prepared by CEQ is now circulating for comment.**

Wetland And Floodplain Decision-makers Need Not Only Wetland, Riparian And River Assessment Information But Guidance With Regard How To Better Apply This Information

- **Regulators At All Levels (Zoning, Subdivision Controls, Building Codes, Other Regulation)**
- **Floodplain Managers**
- **Storm Water Managers**
- **Water Project Planners and Managers**
- **Ecosystem (Including Fish and Wildlife) Planners and Managers**
- **Watershed Planners**
- **Public Land Use Planners and Managers**
- **Comprehensive Land Use Planners**
- **Private Landowners**

Opportunities

- **Many assessment models already developed, much to build upon**
- **Much digital data is available and more coming quickly such as the following (How can we best use it?)**
 - **National Wetland Inventory maps and digital information**
 - **Floodplain maps and digital information**
 - **Air photo and satellite data**
 - **Topographic and soil survey digital and map data**
 - **LIDAR**
- **The ability to analyze, store, and deliver this data has increased enormously (e.g., sophisticated computer systems at modest cost)**

Ongoing State Wetland, Stream, Floodplain, Riparian Assessment Efforts Available To Build Upon

Examples of ongoing surveys, assessment efforts

- **Scenic and Wild River Surveys (33 states, ongoing)**
- **Water Quality Surveys (Chemistry, Biology) 305(b), 303(d). Virtually all states.**
 - Point sources
 - Nonpoint sources
 - Listed waters (impaired)
- **Statewide or Regional Flora and Fauna Surveys (Water Quality, Fish and Wildlife, Water Resource, Heritage Agencies). Many states.**
 - Anadromous Fish
 - Endangered Species
 - Biodiversity (Heritage Programs)
 - IBI
- **Statewide or Regional Stream Stability Surveys (Vermont)**
- **River Restoration Surveys, Restoration Efforts (State-wide or Regional)**
 - Maine
 - North Carolina

- EPA Funded Wetland “**Advanced Identification**” Efforts and **SAMPS** (e.g., West Eugene, Juneau, Du Page County, the Everglades)
- **GIS-related** Comprehensive Planning, Floodplain, Other Types of Resource Analysis and Planning Models (e.g. CREWS in South Carolina)
- **Statewide/regional studies identifying** “important” wetlands (e.g. Oregon Wetlands Conservancy statewide surveys)
- **Specialized Surveys and Maps**
 - Filled areas (Washington)
 - Boundaries of public waters (Florida)
 - Fens (Minnesota)
 - Vernal Pools (Massachusetts)
 - Wetland Compliance Surveys (e.g., Massachusetts)
- **Watershed Studies** With Wetlands/Streams as a Major Component

Types of Information Needed By Regulators

- **Where are the regulated resources including resource boundaries?**
- **What are the resource characteristics?**
 - Hydrology
 - Soils/geology
 - Vegetation
 - Condition
 - Sensitivity
 - Connectivity
 - Scarcity
- **What functions are provided by specific wetlands?**
 - E.g., flood storage and conveyance
 - Habitat
 - Fisheries
 - Recreation
 - Etc.
- **What functions/values are provided?**
 - Opportunity
 - Social significance

More Than 100 Wetland Assessment Models

- **More than 100 wetland assessment techniques developed by 2004 alone.** See C. Hatfield, J. Mokos, J. Hartman, Development of Wetland Quality and Function Assessment Tools and Demonstration, June 2004.
 - “Currently there are numerous rapid assessment methods in existence or in development that are designed for or applicable to wetlands. Just the sheer number of methods (over 100 evaluated in this study) reflects the fact that there is no one method that will achieve all of the goals that may be desired for wetland functional assessment.”
- **More than 80 tools for ecological assessment.** See 2004. “ National Inventory/Survey, Tools for Ecological Assessment. National Park Service.
<http://www.websitefororg.com/OldWebsites/NPS/CompiledMethodsFrameset.htm>
- **40 Wetland Functional Assessment Procedures.** National Academies Press, (2001) Appendix H. Selected Attributes of 40 Common Wetland Functional Assessment Procedures.

Examples of State Wetland Assessment Models

- FACWet. Colorado
- CRAM. California
- DERAP. Delaware
- NC WAM. North Carolina
- WRAP. Florida
- KY WRAM. Kentucky
- MiRAM. Michigan
- NDRAM. North Dakota
- ORAM. Ohio
- ORWAP. Oregon
- TXRAM. Texas
- UDOT. Utah
- WI RAM. Wisconsin

Techniques Vary Considerably

- **For what purpose and audience?**
 - Regulatory permitting
 - Impact reduction
 - Mitigation
 - Etc.
- **What is assessed?**
 - Natural processes (“functions”)? Goods and services? Condition? Economic value? Other?
- **At what scale, degree of accuracy?**
- **How is information processed?**
 - Manual manipulation of data
 - Computerized manipulation (e.g., GIS)
- **Products:**
 - Maps?
 - Graphic displays?
 - Written reports?
- **Costs, level of staff expertise required?**

Opportunities To Build Upon Existing Assessment Models

Models and methods for assessing functions may be broadly grouped in three overlapping categories which share characteristics but differ in their foci. All can be useful in assessing the potential of wetlands and floodplains to produce goods and services:

- Models such as HGM which assess floodplain/wetland natural “processes” (e.g., denitrification),
- Models such as WET which assessing the potential of wetlands to produce “goods and services” (e.g., pollution control) including “opportunity” and “social significance”, and
- Models such as IBI and HGM which assess floodplain/wetland “condition”.

Efforts to Develop a National Wetland Assessment Method: Some Significant Models, Techniques

1970s, EARLY 1980s. JOE LARSON ET. AL, UNIV. OF MASS. MODELS FOR COMPARATIVE ASSESSMENT OF WETLAND FUNCTIONS AND VALUES.

- Models provide comparative ranking based on functions/values.
- Goal is to a considerable extent the identification of outstanding wetlands
- Some use for regulatory purposes in Massachusetts.

1980s, EARLY 1990s. WET (WETLAND EVALUATION TECHNIQUE) and “BABY” WETS

- Developed by the Corps with the Federal Highway Administration, EPA and many others. Six states developed “baby” WETs.
- Looked at “opportunity” “social significance”, “effectiveness”
- Useful in providing first cut evaluation of wetland functions (services). But, did not provide the level of quantitative evaluation needed for application of the no net loss standard, mitigation ratios.
- Rated and ranked individual “ functions”.
- Complicated and fairly time consuming.
- Was not responsive to different wetland types or to regional differences in wetlands.
- Quite subjective.

2005- 2013 HGM (HYDROGEOMORPHIC APPROACH

- Starting in 1994, models was developed by the Corps with much help from EPA, NRCS other agencies. Many millions of dollars spent on models.
- Classifies wetlands by hydrogeomorphic setting.
- Uses reference.
- In 1996 Federal Agencies set a goal in the Federal Register. HGM was to be used on 80% of the 404 permits within two years. After eighteen years, HGM is not being used in any systematic way in any regulatory context.
- Complicated, basic premises not fully tested. Nevertheless, useful.
- Many states have made some use of HGM. Washington adopted HGM models, many others have incorporated some measure of HGM into their programs. However no one has adopted HGM per se.

2005-2013 NEW ENGLAND HIGHWAY METHODOLOGY WORKBOOK SUPPLEMENT: WETLAND FUNCTIONS AND VALUES

- Simple procedure focusing on wetland functions and values.
- Subjective evaluation but quite broadly used as a preliminary screening procedure.
- A number of states have informally adopted this method

1990-2013 IBI (INDICES OF BIOLOGICAL INTEGRITY)

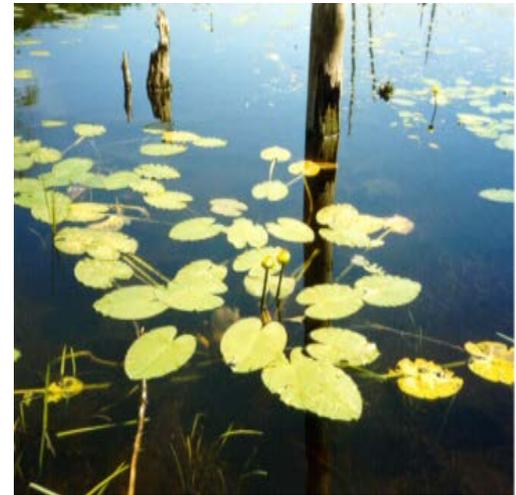
- **Uses reference**
- **Widely used for lakes, streams, coastal areas, to a lesser extent for wetlands**
- **Biologically and botanically based**
- **Measures relative condition**
- **Does not measure goods or services**
- **Many states have investigated use, ongoing development of models**
- **Progress in developing effective models has been slow**

1993-2013 (PROPER FUNCTIONING CONDITION)

- **Applies to riparian areas**
- **Has been applied primarily in the West**
- **Used to determine overall condition of riparian areas, identify potential restoration sites.**

HAVE ASSESSMENT METHODS BEEN WIDELY USED ?

- **Considerable interest by regulators, land use managers, others in improved assessment methods. But.....**
- **Little use of any method by regulators other than some use of HEP, WET spin-offs and New England Highway Methodology. Some use of IBI, HGM and other condition assessments (e.g., Ohio).**
- **Search for “Nirvana “, “The Holly Grail, “The Silver Bullet” continues.**



Reasons for Limited Use

- The issue is not whether an assessment technique has some useful features but whether the technique is consistent with available funding, staffing, and expertise.
- Practical restraints often include:
 - **Costs for undertaking assessment too high**
 - **Too complicated**
 - **Too difficult to understand**
 - **Does not meet legal requirements**
 - **Requires too much expertise**
 - **Takes too long**
 - **Does not provide enough of the right information**



Regulatory Legal Needs Are Often Not Adequately Addressed

- Statutory Definitions Not Applied (e.g., definition of “function”)
- Statutory and Administrative Goals and Criteria (e.g, “no net loss”) Not Applied
- Mapping Requirements Not Met
- Notice and Hearing Requirements Not Met
- Time Restraints on Permit Processing Not Observed
- Monitoring, Record-Keeping Needs Not Met



For Example, Assessment Methods Typically Provide Only a Small Portion of the Information Needed for Section 404 "Public Interest" Review

Section 320.4 (a)(1) of the U.S. Army Corps of Engineers Administrative Regulations requires the consideration of the following factors in evaluating a Clean Water Act Section 404 permit:

- Conservation
- Economics
- Aesthetics
- General environmental concerns
- Wetlands
- Historic properties
- Fish and wildlife values
- Flood hazards
- Floodplain values
- Land use
- Navigation
- Shore erosion and accretion
- Recreation
- Water supply and conservation
- Water quality
- Energy needs
- Safety
- Food and fiber production
- Mineral needs
- Consideration of property owners, and, in general, the needs and welfare of the people

Assessment Models Often Fail to Generate Priority Information Such As

- **Endangered species**
- **Stream equilibrium**
- **Water quality**
- **Flood storage and conveyance**
- **Recreational impacts**
- **Existing uses and stressors**
- **Cultural impacts (historic, archaeological)**

For Example, A Court Held That Use of HGM for a 1000 foot Highway Corridor in Utah Did Not Adequately Assess Impact of a Proposed Highway Upon Migratory Waterfowl

Utahns v. United States DOT, 305 F.3d 1152
(10th Cir. 2002)



Assessment Method Does Not Provide Decision-Makers With Adequate Information Concerning Goods and Services

- Flood storage.
- Flood conveyance.
- Wave reduction.
- Erosion control.
- Habitat for fish, shellfish, waterfowl, many types of endangered species.
- Sediment reduction in lakes, reservoirs, streams, estuaries, and coastal systems.
- Pollution prevention and treatment:
 - prevent pollution from entering a water body.
 - treat (remove) pollution in a water body.
- Natural crops and timber: cranberry, blueberry, saltmarsh hay, aquaculture species, wild rice, forestry, other natural crops.
- Groundwater recharge.



- **Scenic beauty, aesthetics.**
- **Recreational opportunities, ecotourism.**
- **Historical, archaeological, heritage, and cultural opportunities.**
- **Education and research.**
- **Trapping of carbon, carbon stores important to moderation of global warming.**
- **Micro-climate modification.**

There Are Questionable Correlations Between “Condition” and Some “Functional/Values”

- Condition and habitat functions/biodiversity. Good correlation.
- Condition and protection of endangered species. Good correlation.
- Condition and recreation. Some correlation.
- Condition and pollution control. Some Correlation.
- Flood storage. Limited correlation.
- Flood conveyance. Limited correlation.
- Erosion control. Limited correlation.
- Ground water recharge. Limited correlation.

Assessment Results Are (Apparently) Often Inaccurate
Particularly If Based Entirely Upon Remote Sensing;
Field Surveys Are Indispensable But Time Consuming and
Expensive



Not Really Rapid

- Field visit may take only an hour or two, but
 - How much preparation time is needed in the office?
 - How much time and expense to get to and from the assessment site?
 - How much time to analyze the information?
 - How much time to process and store the information?
- In New York a two hour field visit to a wetland site in the Adirondacks could take three full days or more because of pre and post activities.

Quasi-Quantitative Methods Misleading

- There is broad skepticism in the regulatory community concerning the use of quasi-quantitative methods utilizing simplified indicators or “metrics” except as preliminary step in more focused and (in some instances) and more accurate assessment.
- For example the Corps of Engineers in “The Highway Methodology Workbook Supplement, which sets forth a Descriptive Approach for Assessing “Wetland Functions and Values”, explicitly rejected the use of the Wetland Evaluation Technique (WET) stating that “WET analyses typically include high, moderate and low rankings which can imply a more quantifiable data base than actually exists, thereby biasing the reviewing agencies.” The Corps further provides in this document that **“Methods using subjective ratings are not acceptable.”**
- There is also a fear among regulatory agencies that formal adoption of any assessment method which meets only a portion of an agency's needs will, practically, foreclose use of other approaches

Intended User Not the Actual User

- Who carries out the actual assessments?
Government employee? Landowner?
Consultant? Example: Problems With The
1989 Draft Wetland Delineation Manual.
- What discretion do they have?
- If “reference” is used, who defines the
reference domain?

Models Are Too Inaccurate Due to Simplifying Assumptions

- **Inevitably, simplifications and assumptions must be made. But, with simplifications and assumptions come inaccuracies.**
- **For example, many features contribute to functions/values. Which ones are to be addressed in assessment? Which are to be ignored? Hydrology? Flora? Fauna? Topography? Soils? Geology? Existing uses? Restoration potential? Other?**
- **Examples of simplifying assumptions:**
 - **Hydrology will continue to be as it is presently observed.**
 - **Plant/tree stem density indicate water retention.**
 - **“Condition” suggests “functions”.**
 - **Functions” suggests values.**

“Values”, “Opportunity”, “Social Significance” Are Ignored

It is difficult to objectively determine “values”, “opportunity” and “social significance”. But

- How can the “public interest” in permitting or denying an activity (e.g. Section 404 permit) be determined without considering the impact upon the “public”?
- How can identification of “red flags”, often the first step in regulatory permitting, be carried out without consideration of values, opportunity, and social significance?
- Values, opportunity, and social significance are relevant to
 - Denying, permitting or conditionally permitting a permit application
 - Establishing “mitigation” ratios
 - Setting restoration priorities
 - Carrying out watershed-scale analyses (e.g., planning source water protection, floodplain management and stormwater systems, pollution control efforts)

Future Directions

What are productive future directions for assessment of functions and values? Some suggestions include:

- **No single assessment technique will suffice to meet the full range of assessment needs.** Agencies and academics should continue to develop or modify existing assessment models to address specific functions/values including monetized evaluation approaches.
- Those developing assessment models need to describe the **assumptions, simplifications, and inaccuracies** inherent in their models. Otherwise techniques are often misleading.
- **Cost and available funds** will continue to be the major limitation upon implementing assessment techniques.

Do No Harm

- Once assessment approaches are formally adopted, regulatory agencies are legally required to use them. Regulatory agencies therefore need to proceed with caution in formally adopting methods.
- All techniques should be field tested regulators and other managers for accuracy, cost, and required expertise.

NEED TO APPLY A COMBINATION OF WETLAND, RIVER AND STREAM, RIPARIAN AND FLOODPLAIN-RELATED ASSESSMENT MODELS

- **Wetland Assessment Models**
 - New England High Methodology
 - HGM
 - IBI
 - Wetthings
- **River and Stream Assessment Models**
 - Stream Stability Models (e.g., Rosgen)
 - HEC and Other Hydrologic and Hydraulic Models
 - Vermont Department of Natural Resources (Kline)
 - IBI
- **Riparian Assessment Models**
 - Proper Functioning Condition
 - Washington Department of Ecology (Hruby)



Agencies Need to Recognize That Different Tools Have Different Assessment Needs; Document and Respond to These Needs

- Regulation
- Acquisition
- Restoration
- Public land/water planning and management
- Scientific study, education

Adopt Definitions Consistent With Statutory Criteria And Needs

- “Functions”
- “”Natural processes” versus “goods and services”?
- “Values”
- “Condition”
- “No net loss”
- Other

Use Decision-making Processes Which Base Decisions, To The Extent Possible, Upon Known And Relatively Certain Information And Avoid The Necessity Of Making Difficult Assessments And Decisions Based Upon Problematic Assessments.

For example, permits for activities in floodplains and wetlands may be rejected on the following grounds before an expensive, time-consuming and error-prone effort is made to analyze specific wetland or floodplain functions or functions and values:

- Failure to demonstrate water dependency,
- Failure to demonstrate that alternative sites are not available,
- Problems with natural hazards and/or impact of proposed activity upon natural hazards,
- Inconsistency with other regulations,
- Inadequate proof of ownership, ownership problems, and
- Documented, special resource characteristics (e.g., endangered species).

Apply Multi-Level Assessment Approaches; Relate Broad Scale Assessment to Intermediate and Site-Specific Assessments

Develop both preliminary, overview assessment procedures and more detailed follow up procedures for not only biological/botanical information but many other types of information. E.P.A. three assessment levels are useful.

1. Broad, Qualitative Overview.

1. Functions
2. Values
3. Issues
4. Problems

2. More Detailed Investigation of Particular Problems Functions, Values, Etc.

1. IBI
2. HGM
3. HEC
4. Rosgen
5. Proper functioning condition
6. Etc.



Apply An Assessment Method or Methods Which Progressively Narrow The Issues

- **Utilize an assessment approach which progressively narrows the issues and areas that need detailed analysis through various "red flagging" or other filtering mechanisms.** Such approaches may first determine whether particular functions, hazards, other problems or values may exist at a site and, second, whether there may be significant impacts on society if these are damaged or destroyed. If so, more detailed analyses may then be conducted. Such red flagging or filtering may use a variety of sources of information:
 - Information supplied by landowners/developers seeking permits,
 - Office analysis of permit applications and use of existing data,
 - Consultations with other regulatory and resource agencies,
 - Field visits,
 - Public notices and analysis of comments, and
 - Public hearing and analysis of comments.

Apply A Broad Range of Strategies and Techniques to Cope With Limited Budgets, Small Staffs, and Limited Staff Expertise

- Make use of existing air photos, satellite imagery, other existing sources of information
- Apply “red flagging” and other filtering techniques to identify resources at risk and focus protection and management on such resources
- Shift much of the data gathering burden to permit applicants

Develop Regulatory Guidance Clarifying the Use of “Condition” In Regulatory Contexts

- Are wetlands with low relative condition to receive reduced protection as called for in House Bill 1330 (1991)?
- Or, are wetlands with low relative condition to be “restored and maintained” as called for in Section 101 of the Clean Water Act?

Carry Out Multiobjective Assessments; Combine River/Stream, Floodplain, Wetland Assessments

- **Postflood**
- **Preflood**



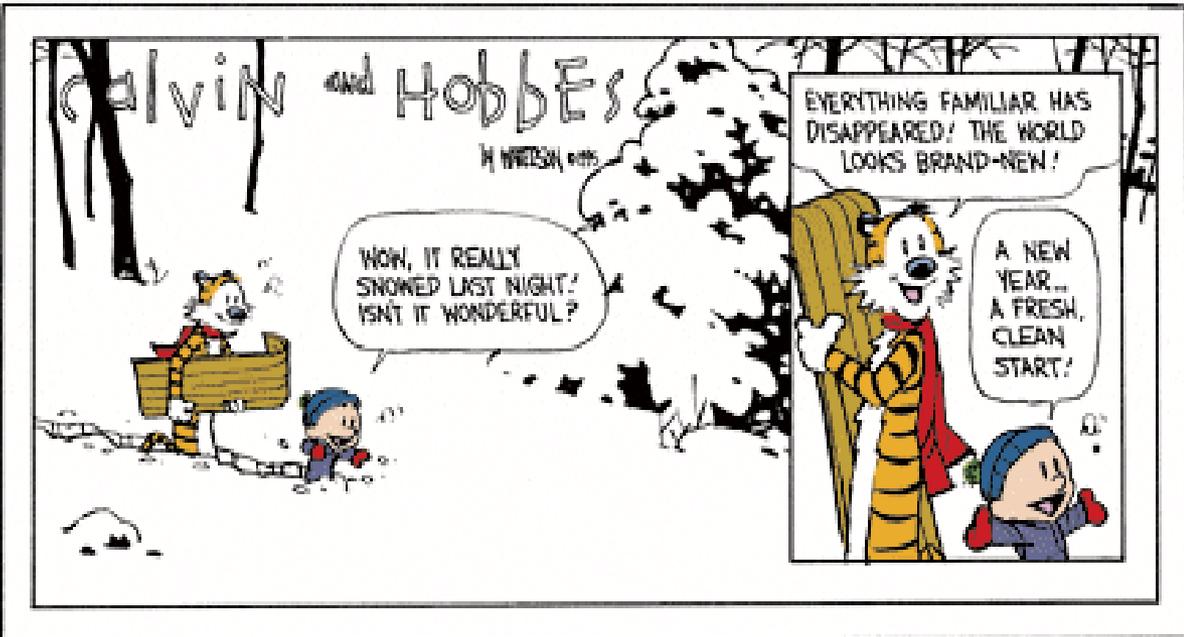
Old Mill (Agway), Berne, NY
Berne Fire District photo.



Tsunami: December, 2004 South Asia



Geoff Mackley



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Thanks!
MUCH STILL TO BE LEARNED
“EXPLORE”

