

Information Needs for Integrated Management
New Brunswick Aquaculture Site Allocation Policy
& the Fundy North Fishermen's Association

Donna G. Curtis¹
Melanie G. Wiber²
Maria Recchia³

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¹ PhD Candidate, Interdisciplinary Program, University of New Brunswick
Department of Anthropology - Annex C. Building, Room 28

PO Box 4400 Fredericton, NB Canada E3B 5A3 donna.curtis@unb.ca (506) 260-4724

² Professor of Anthropology, University of New Brunswick – Dept. of Anthropology, University of New Brunswick, Box 4400, Fredericton, NB, Canada. wiber@unb.ca

³ Executive Director – Fundy North Fishermen's Association, 62 Princess Royal Street, St. Andrews, NB, Canada mariarecchia@nb.aibn.com

Curtis
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1. Introduction

In 2000, the Canadian province of New Brunswick introduced a policy for finfish aquaculture that required a three bay management plan, i.e. operations are to have a separate site for each of three production stages. This will require additional aquaculture sites in an already crowded marine environment. However, the policy also provides an opportunity for capture fishermen to provide input to the site selection process. While community stakeholders were only asked to choose three among six possible sites, some stakeholders are taking the opportunity to promote a more integrated approach to marine space planning. As a participating community stakeholder, the Fundy North Fishermen's Association (FNFA) wishes to build a reliable information resource that will allow them to participate more effectively in this and in future management decisions. This opportunity for a stakeholder group to provide input has led to a research collaboration that will be described in this paper.

This paper thus reports on the early stages of this research project that will ultimately examine both the information available to make decisions about coastal resource management, and the delivery mechanism for making such information available to all stakeholders. The paper begins by defining integrated management as it applies to our Canadian case study. We then turn to a description of our field site and the community group with whom we are working. This is followed by a discussion of the role of information in integrated coastal resource management and the barriers that block information flow. Finally we suggest various mechanisms that we hope will address this problem.

2. Integrated Management

2.1 Integrated Management Approach for Canadian Coasts

From sea to sea to sea, Canada has one of the longest national coastlines in the world. This coastline represents sea beds equal to two-thirds of the country's land mass; a vast expanse of coastal communities and economic potential for the nation (Ricketts and Harrison 2007). In 1997 the adoption of Canada's *Ocean Act* (Canada 1996) mandated the implementation of an integrated management approach to ensure the sustainability of this resource. Clear direction for this integrated management however

was not established until 2002 with the Fisheries and Oceans Canada (DFO) publications *Canada's Ocean Strategy: Our Oceans Our Future* (Fisheries and Oceans Canada 2002a) and the *Policy and Operational Framework for Integrated Management of Estuarine, Coastal and Marine Environments in Canada* (Fisheries and Oceans Canada 2002b). These documents state that integrated management regimes along with sustainable development and precautionary approaches⁴ are central to the adoption of an overall Integrated Management (IM) governance of Canada's oceans. DFO, the lead federal body in charge of the IM mandate defines *integrated management* as a perpetual process to facilitate decisions about resource use and access (Fisheries and Oceans Canada 2002a). Integrated management promotes the establishment of cooperative networks between all resource users for a particular resource area. These networks are created by addressing the full spectrum of fragmented and often conflicting interests that may be held by stakeholders while simultaneously ensuring the focus remains on sustaining and protecting the environmental resources (Fisheries and Oceans Canada 2002b).

2.2 The Role of Information and Knowledge within Integrated Management

Section 31 of the *Oceans Act* (Canada 1996) states that under the Minister of Fisheries and Oceans Canada, and in collaboration with other ministers, the necessary networks will include

“...boards and agencies of the Government of Canada, with provincial and territorial governments and with affected aboriginal organizations, coastal communities and other persons and bodies, including those bodies established under land claims agreements,”

And shall

“...lead and facilitate the development and implementation of plans for the integrated management of all activities or measures in or affecting estuaries, coastal waters and marine waters that form part of Canada or in which Canada has sovereign rights under international law”

The Act also states that the implementation of integrated management *will* be a cooperative effort with all parties listed in section 31 and that this process *will* “gather, compile, analyze, coordinate and disseminate information” (Canada 1996). The creations

⁴ Space limitations will not allow a full discussion of the various working definitions of “sustainable development” and the “precautionary approach” – thus, we will focus on the concept of integrated management as it is influencing Canadian policy development.

of necessary networks and cooperative efforts cannot be established without information access and dissemination. Information and knowledge are therefore central to effective integrated management.

Since the United Nations Conference on Environment and Development's 1992 Rio Declaration coastal communities around the globe have been increasingly adopting and experimenting with their ocean management regimes (Leschine et al. 2003; Olsen 2003; Christie 2005). Simultaneously the body of scholarly research on ocean management regimes has also been growing both in expanse and credibility. Numerous resource management approaches have been undertaken but Integrated Management (IM)⁵ continues to gain the most support as an effective management strategy. IM uses a multi-disciplinary approach to address the tandem requirements of maintaining the sustainability of the biophysical environment and the livelihoods of the community stakeholders who depend on the resources in question (Olsen 2003). The collaboration that ensues must be an adaptable ongoing effort which addresses the social, economic, institutional, environmental and legal interests of these stakeholders and the resources being managed (Christie 2005).

Within Canada, both the federal and provincial approaches to fisheries resource management have been dominated by biology and economics. The resulting management regimes have used a bio-economic management approach, which aims for the "bottom line", or the perceived maximum economic value that can be extracted from a single resource leaving only what is necessary for resource regeneration. (e.g. Maximum Sustainable Yield, MSY or Maximum Economic Yield, MEY). Missing from this linear approach are the complexities that exist between ecosystems' interdependence and the political complexities of human resource use. Resource stakeholders, individuals, government, private industry, civil society and local communities all have a vested interest in the resource (Carlsson and Berkes 2005). Each of these stakeholders or stakeholder groups may take a unique and potentially conflicting perspective on defining, accessing and extracting the resource. Operationally, information and knowledge sharing must come from all stakeholders to address multiple layers of ecosystem and socio-

⁵ Although the term Integrated Coastal Management or ICM is widely used we will keep with the current practice of using Integrated Management currently found in Canadian legislations and policies.

economic complexities. This essential component requires an acceptance that neither ecological systems nor human social systems operate in isolation and both systems must be viewed in combination with one another and with potential for compounding impacts (Gunderson and Holling 2002).

~~Institutional arrangements~~ must also be established that will encourage stakeholders to adopt and participate in a co-management process (Gray 2005). This approach distributes management responsibilities between both state and the resource stakeholders (Carlsson and Berkes 2005). Management collaboration can range along a continuum of participation levels (e.g. almost completely state managed to almost completely community managed) and of participation effort (e.g. simple information exchange to formal partnership agreements) (Beem 2007). In any case, co-management must include information and knowledge exchange. The sharing of information and knowledge from all stakeholders is key to IM (Lewins 2006).

Although the sharing of information and knowledge is essential this does not imply a willingness on the part of stakeholders to participate in such a process. Current management approaches may lack incentives for information sharing. Examination of information and knowledge sharing within the fishing industry in general has demonstrated that requests from fishers to share information with government officials “for the good of the resource” has been met with high levels of suspicion. Most notably, the fishermen are suspicious of the information they give being ultimately used against them (Ames 2007; Williams and Bax 2007) through such management schemes as the enforcement of species quotas or area closures. Conversely, fisheries managers, although respecting fishermen’s perspectives, most often see this local and often traditional knowledge as anecdotal and potentially of value only once supported by what is accepted as scientific evidence (Baelde 2007).

Integrated management regimes must establish institutions and therefore incentives that will overcome such barriers to the free exchange of information. Successful coordination and collective action within the fishery requires social capital, networks and institutional incentives that facilitate the necessary flow of information sharing and trust building for fisheries co-management (Rudd 2004).

2.3 Community-University Research Alliance (CURA)

The Canadian Social Sciences and Humanities Research Council (SSHRC) has provided funding to establish strategic research programs such as Community-University Research Alliances or CURAs across the country. Each CURA holds the broad objective of addressing global challenges facing local and regional communities in the 21st century (e.g. globalization, the growth of multi-national companies, and resource and stock depletions). Using the strengths of both local and academic knowledge, CURA are focused on addressing social, cultural and economic development by way of training, skill development, knowledge sharing and research (SSHRC 2008). The specific goals of the CURA program include capacity building, sharing of information and knowledge and development of strategies for decision-making and for the enrichment of academic curricula.

The Coastal CURA is a five-year project which takes a regional focus on livelihood problems facing coastal communities in the Canadian Maritimes. The CURA is an alliance of First Nations communities, fishermen's associations, civil society and non-governmental organizations, and university participants from the Maritime Provinces (New Brunswick, Nova Scotia and Prince Edward Island). Specific goals for Coastal CURA include addressing: the current effectiveness of coastal resource governance; increasing community capacity to participate in the integrated management of the coast; establishing of a maritime network for community-level governance; and coastal community and resource research innovation and knowledge generation (Coastal CURA 2008).

As project participants in the Coastal CURA, we have focused on coastal southwest New Brunswick (SWNB), an area that is undergoing rapid expansion with numerous competing demands for resources in this area including the capture fishery, aquaculture, shipping, industrial development, tidal power, and tourism. One project involves helping to build an integrated management plan for the region's aquaculture industry.

3. The Bay of Fundy

3.1. Busy Bay

Historically, fisheries resources have provided a significant contribution to the social and economic fabric of New Brunswick. For the province's coastal communities the fisheries sector has often been the sole or one of the few providers of economic livelihoods. SWNB with its unique and rich tidal waters is viewed as a potential economic growth area in a region that has struggled economically. The Bay supports fishermen who hold approximately 325 lobster licenses, 200 ground fishing licenses and 217 weir licenses (Southwest New Brunswick Marine Resources Planning 2008). There are currently 97 aquaculture site locations within the SWNB portion of the Bay, including licenses for finfish species (Atlantic salmon, cod, halibut) as well as bivalves (mussels) and aquatic plants (Anderson 2007). Shipping traffic into the port of St. John is on the rise and the potential development of a proposed second oil refinery to address the eastern Canadian and US demand for an additional 150,000 to 300,000 barrels per day (Irving Oil 2008)) will certainly add to vessel traffic. The Bay also hosts several species listed under the Canadian *Species-at-Risk Act* such as the leatherback turtle, harbour porpoise and a variety of whale species and many migratory birds. Finally, there are 10 tourism operations (e.g. whale watching) located in the SWNB as well as the development of a provincial "energy hub" through oil and gas exploration, tide and wind energy production and liquid natural gas liquefied natural gas (LNG) pipelines. The management and coordination of these burgeoning activities has both stressed government capacity and challenged traditional users of the Bay.

These heavy demands on the Bay of Fundy and its coastal communities have led DFO and the province of New Brunswick to initiate the *Southwest New Brunswick Marine Resource Planning* process in 2004. This process has involved numerous community consultations and opportunities for stakeholder input, leading the Marine Resource Planning Steering Committee to adopt the dubious mantra "A plan by the people for the people" (Farquarson 2008). However, many traditional users of the Bay feel the process has been badly flawed. In fact, the present reality is a region whose resource depletion is seriously challenging coastal community survival.

3.2 The Aquaculture Industry - Southwestern Bay of Fundy

In 1979, the first aquaculture sites appeared on the New Brunswick side of the Bay of Fundy (Anderson 2007). Only a couple of sites were in operation at any one time and the early finfish sites were independent operations. By the mid 1980s, however, the Bay had become a primary site for a salmonid aquaculture industry, specifically Atlantic salmon (*Salmo salar*). The government promoted the rapid expansion of this young industry in order to preserve coastal communities and provide economic growth and jobs (Fisheries and Oceans Canada et al. 2005). Aquaculture related opportunities led to a 27% rise in jobs between 1986 and 2001. However, in recent years there has been a serious economic downturn for the industry with company closures, serious job losses and regional population decline (Fisheries and Oceans Canada et al. 2005). This is linked to large bouts of disease (particularly ISA or Infectious Salmon Anaemia), changes in market conditions (e.g. global market competition), overstocking in site locations and increasingly negative media coverage.

Nevertheless, as global fishing stocks continue to fall prey to depletion (Costa-Peirce 2002), aquaculture has increasingly been touted as a protein source solution. From an industry standpoint modern aquaculture practices are considered to be both economic and resource efficient. In 2005, the NB provincial aquaculture production was valued at \$205 million a volume of approximately 37,000 MT. Aquaculture production is said to have created nearly 4,400 direct and indirect jobs rearing species, harvesting, food processing, and cage and net manufacturing (New Brunswick 2007). Regulatory jurisdiction over aquaculture is somewhat unclear. DFO has responsibility for fishery stock management. However, the provincial Department of Fisheries has jurisdiction once resources have reached the wharf. Under an intergovernmental *Memorandum of Understanding*, management of the aquaculture industry is under the provincial Department of Agriculture and Aquaculture. Other agencies oversee overriding federal legislation such as environmental impact assessment (Environment Canada) or compliance with food safety regulations (Canada Food Inspection Agency). In 2008, the New Brunswick fisheries department developed the *Fisheries Renewal Framework* to contribute to the current government's vision of obtaining provincial self-sufficiency by

the year 2026. The framework promotes a vision of substantial growth and development within the provincial aquaculture sector (New Brunswick 2008).

3.3 The Bay of Fundy Marine Aquaculture Site Allocation Policy

In 2000, the provincial Department of Agriculture, Fisheries and Aquaculture released the *Bay of Fundy Marine Aquaculture Site Allocation Policy* and the *Bay of Fundy Marine Aquaculture Site Allocation Application Guide*. The policy states:

“As a result of the significant contribution to the social and economic fabric of the Bay of Fundy by aquaculture and commercial fisheries, the policy is recognised as a major tool to fostering a positive climate for the co-existence of these two sectors through improved consultation.” (Department of Agriculture, Fisheries and Aquaculture 2000:3.)

For the overall health of the NB aquaculture industry, the Policy specified that sustainable practices were to be adopted immediately. Among the new practices was the use of a “single year class entry” site, which required, over a three year period, that operators keep only one generation of fish per site. Therefore, each crop cycle will work in a three year cycle; year one, salmon are moved to open water as smolts (fish ready to go from freshwater to seawater), year two, fish grow through to grilse or adult⁶ phase (one sea winter) and the third year, salmon are harvested and the site must remain fallow for the year. As a result, the single year class entry site practice requires that all operators must have more than one site in production to continuously have product for market, in turn requiring that the province approve more sites for licensing. Each of the three sites for the aquaculture operations would be located in a separate Bay Management Area (BMA) (Anderson 2007). In a bay that is considered by many stakeholders to be overcrowded, the addition of new aquaculture sites has not been readily accepted. In recognition of this, the Policy also established the opportunity for stakeholders to raise concerns and questions with each other and with the province before new site locations are assigned within the Bay.

⁶ It is important to note that grilse and adult phases are distinct in that the latter is preferred for commercial production. Many fish will mature to the grilse phase after one winter at sea but will not grow larger. The adult phase, in contrast, is a larger, hardier fish most often seen in the wild after two or more winters at sea.

It was not until March of 2007, however, that the required legislation to mandate the Policy was added to the New Brunswick *General Regulation – Aquaculture Act* (New Brunswick 2007). Under the regulations, the necessary additional sites must be in place for the fall of 2008, whether “new” to a particular operator (i.e. subleases of a vacant site from another operator) or a newly allocated and constructed site.

4. The Fundy North Fishermen’s Association

4.1 Overview of Fundy North Fishermen’s Association

Fundy North Fishermen’s Association (FNFA) was established in the mid 1980’s, and is a not-for-profit fishermen’s organization that represents license holders (e.g. lobster, scallop, eel and gasperau) as well as crew members. The association has approximately 75 members⁷. The administrative structure of the association is composed of a volunteer board of directors (9-12 members) and two half time paid positions, an executive director and an administrative assistant. FNFA participates as a stakeholder advocate regarding all matters affecting the capture fishery within the Bay of Fundy and surrounding regions. The association’s executive director and Board of Directors lead the majority of advocacy work on behalf of its members. The executive director also acts, along with the association’s president and other board members, as media spokespersons, as well as arranging FNFA collaboration with other fishers associations, interest groups (including industry), and other not-for-profit organizations in the region. The FNFA mission statement is:

To support fishermen, promote healthy fisheries, and encourage viable fishing communities in Southwestern New Brunswick (Recchia 2008).

4.2 Fundy North Fishermen’s Association – Public Action

Since 2004 FNFA has been receiving written notice and initial survey maps for proposed aquaculture sites to be located in SWNB. FNFA for its part has responded in writing to the appropriate authorities and participated, when invited, to attend and present their comments and concerns to the Aquaculture Site Evaluation Committee (ASEC).

⁷ Many regional fishermen choose to remain independent and do not join fishing organizations. Fishermen with multi-species licenses may also hold membership with other organizations such as the Fundy Weir Fishermen’s Association.

Provision for this committee is found in the *Bay of Fundy Aquaculture Site Allocation Policy* and *Aquaculture Site Allocation Application Guide*. Currently ASEC has representatives from various provincial and federal government departments but no provision for community stakeholder members. Although this is the only “public consultation opportunity”, only those stakeholders who have been invited may address the committee through individual presentations approximately 20 minutes in length. There is no discussion during these meetings among community stakeholders.

In collaboration with others, FNFA has also requested a moratorium on aquaculture industry growth until coastal resource management has been completed, scientific studies have been conducted on habitat areas of concern, and specific aquaculture-capture fisheries conflicts (e.g. gear loss) have been addressed. Their concerns led to a meeting with the provincial Minister of Agriculture and Aquaculture and federal DFO representatives in January 2008. Currently the FNFA is working in cooperation with Fundy Weir Fisherman's Association, Grand Manan Fishermen's Association, Connors Bros. Ltd and the Campobello Fishing Association under the title of the Traditional Fisheries Coalition⁸. Together they continue to raise their collective concerns about the growth of the aquaculture industry in the region.

FNFA is logical stakeholder to include in community consultation process, given its mandate, its active voice for the community, and concern regarding fishery habitat destruction, gear damage and propeller entanglements at unmarked aquaculture anchor lines. In 2007, public notice was received for three new aquaculture site allocations in the SWNB⁹. Due to the immediate nature of these requests, FNFA took the bold move to initiate consultation with the proposed site proponents on potential sites that would meet the concerns of all stakeholders involved. FNFA then presented their recommendations to other fisheries associations. Final recommendations were presented to the provincial government and FNFA has met with some success on the physical placement of sites. However this is only one piece of the allocation process. Other important issues that the government has yet to address include the capture fisheries request for an eight year

⁸ The number of fishermen affected is indicated by licenses; for example, there are approximately 280 lobster license holders in SWNB.

⁹ Currently there are only a handful of independent aquaculture operators within SWNB. After the significant losses of the 1990s many operators sold or made arrangement to pass their sites to Cooke Aquaculture Inc. Cooke Aquaculture Inc. holds by far most of the existing sites in this area.

moratorium on aquaculture development to develop a joint industry growth plan, site buoy markings for vessel traffic, and the tendency for operators to increase overall site size when relocating sites.

5. Information and Knowledge

5.1 Information and Knowledge Access & Dissemination

How communities and stakeholders understand, value and use environmental resources will have a direct influence on how these resources continue to be used and managed. An integrated management approach acknowledges that a full spectrum of information and knowledge must be gathered to ensure informed decisions and choices are made to maintain the sustainability of a resource. This includes social, economic and cultural as well as biological and ecological information about a resource. Before FNFA and other stakeholders can meaningfully participate in the NB Aquaculture Site Selection process, it will be necessary to identify the current information and knowledge, its availability, and existing gaps in knowledge. However, it will be difficult to proceed until the longstanding lack of trust between fisheries resource users and managers has been overcome.

A recent initiative in Canada is the federal Oceans Action Plan (OAP), which was designed to implement integrated management planning for five initial large ocean management areas (LOMAs) (Ricketts and Harrison 2007). Like other initiatives around the world¹⁰, Canadian policy also stressed the need for fully integrated information and knowledge from resource stakeholders. To achieve this, Canada will need to take advantage of the possibilities offered from today's information and communication technology, such as the development of electronic databases and metadatabases (a database for data that describes data)¹¹.

¹⁰ Many relevant past and ongoing oceans initiatives at the international, national, provincial and regional levels led the way for the 1997 implementation of Canada's *Ocean's Act* and its integrated management approach to coastal resources. These initiatives included the United Nations Convention on the Law of the Sea (UNCLOS), Coastal Zone Canada Association (CZC) conferences, Ocean Management Research Network (OMRN) and the Atlantic Coastal Action Program (ACAP).

¹¹ Several good programs are in the development stage and include Nova Scotia Community Counts and Community Accounts Newfoundland and Labrador.

Metadatabase formats allow proponents and stakeholders to consult a public information infrastructure that lists available information sources and often supplies the information being sought. We propose that a resource industry metadatabase will provide a neutral tool for information and knowledge sharing which can be made freely available to all stakeholders. Joint funding from the Mathematics of Information Technology and Complex Systems (MITACS), FNFA and the Coastal CURA has been provided for an exploration of the feasibility of such a database. During a ten week period, we are conducting an information audit through stakeholders' interviews; literature search of academic literature and case studies; and document analysis of provincial and federal legislation (e.g. acts & regulations, policies), association and committee minutes; industry and statistical reports. Metadatabase design and construction will follow the Dublin Core protocol (<http://dublincore.org/>) as well as utilization of shareware.

We also propose to take the development of our metadatabase one step further. Our initial step is to speak with all stakeholders or stakeholder representatives involved in the aquaculture site selection process to identify what information and knowledge they feel they must have or is currently unavailable to make informed decisions. From this starting point not only we will be identifying and collecting from readily available information sources but we will also be identifying information and data that is nonexistent or not freely accessible to the public. We will be challenging information access by exercising the public's right to information using both federal and provincial Access to Information legislation. As we identify gaps in information access we will also be tracking the processes taken for obtaining this material, the time lines and the results of our efforts.

5.2. Information and Knowledge for Decision-Making

The gathering, compiling and maintenance of qualitative and quantitative resource information and knowledge can provide numerous tools for ensuring management decisions are well informed and evidence-based. One of the prominent tools to help ensure decisions are well informed is relevant social, cultural, economic and biophysical indicators (Bastien-Daigle 2008). These indicators (e.g. unemployment rates, landed values of capture fisheries, water quality, industry related training opportunities, species

interactions) can be used to monitor the current state of a coastal resource and community stakeholders, providing a snapshot of the 'state-of-the-bay'. Indicators can also be used for a longitudinal perspective providing early warnings of undesirable or unanticipated changes in resource or community status over time. Participants in the decision-making process can monitor changes and draw value insights from them.

Additionally metadatabases, by their integrated nature, inherently identify unique influences and relationships that might not be identified by examining resource issues in isolation. For example Schouten et. al. (2001) were able to program a Multi-Actor Information System (based on social network analysis) which allowed them to identify potential stakeholders' areas of conflict and approaches to conflict resolution. Metadatabase information can also be used in tandem with other forms of information and communication technology such as geographical information systems (GIS), allowing decision-makers to model potential future outcomes of development alternatives (Nath et al 2000).

A quick search on the Internet demonstrates there are many excellent, creative and user friendly data and metadatabases in use as tools for assisting in environmental management decision making. However, the approaches for information, knowledge and data collection and presentation are often highly dependent on the audience in question. For example, the Aquaport (Aquaport.ca) is targeted to aquaculture development. On the other hand the Human Dimensions (HD.gov) is a community-centered resource hosted by agencies, academia, and nongovernmental and private organizations.

5.3 The Realities of Information and Knowledge Use

Developing a functional and accessible metadata base, although a huge task, it is not our end goal. Regardless of the design we must get stakeholders to use the information resource. Although information sources and availability are rapidly evolving our information accessing habits have not necessarily kept pace. In 2003 study of coastal estuarine policy makers and managers, Leschine et al. (2003) found that these decision-makers, although aware of information access tools, did not necessarily use them. Initial communication with Bay of Fundy fishermen involved in the SWNB aquaculture site allocation process indicates a strong resistance on their part to the use of online resources.

Ironically, their vessels are equipped with related and far more complicated information and communication technology.

Our metadatabase development must serve to achieve three primary goals. First, we must raise awareness of the vast amount of information that exists but that is not currently accessible to relevant stakeholders in a way beneficial to decision-making. Second, we need to rebuild the willingness of stakeholders and government to share information by identifying and dealing with sources of distrust. Finally, our approach must establish and build stakeholder capacity to access information and mobilize knowledge necessary for meaningful participation in similar and future co-management efforts.

6. Conclusion

Information whether it is local and traditional ecological knowledge (LEK/TEK), scholarly and scientific, or factoids and two second sound bites, may have something to contribute to informed decision-making. Unfortunately, so long as government bureaucrats resist sharing their information local stakeholders will do the same. Integrated management, in this scenario, will never be realized.

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Legislation

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