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Chapter 1 : The Theory and Practice of Rivers and New Poems by Jim Harrison | eBay

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To translate the many lessons learned on other river systems to operational decisions on the UMR, a companion workshop for managers and the general public was held immediately after the con- ference. An immediate local need for such sharing has existed for several years, as the U. Corps of Engineers is currently planning commercial navigation activities that will influence the ecological integrity of the river over the next half century. Recently, other equally important management issues have surfaced, including managing the river as an element of the watershed, and assessing its ecological value as a system instead of a collection of parts Upper Mississippi River Conservation Committee, Regional and state natural resource agencies are becoming more convinced that they need to address these issues within their own authorities, however spatially limited, rather than relying on the U. Corps of Engineers to manage the ecosystem as an adjunct to its purpose of navigation support. Regardless of authority or responsibility, management agencies see Acknowledgements supported the conference and workshop for the purpose of providing state-of-the-science ecological guidance. Data and interpretations were presented through platform and poster papers on the definition of river ecological integrity, the ways by which rivers have been impacted by human activity, the future of rivers, and river rehabilitation. This issue of Regulated Rivers: Research and Management is intended to group papers on the UMR or closely related topics. During the conference, a team of scientists convened to synthesize available information into guiding principles upon which agencies could base ecological management strategies. The team of scientists produced a brief draft report that was reviewed by all participants during the last con- ference session. River form and condition is a function of the totality of many actions and processes that occur in the basin, stream network, and floodplain. Degree of connectivity between the main channel and its floodplain is a primary structural attribute of river ecological integrity. The annual flood pulse, channel-forming floods, and infrequent droughts are major driving factors in floodplain river ecosystems. LUBINSKI Rivers and their fauna are very resilient and measures to improve or rehabilitate them, if taken before critical levels are reached, can produce rapid positive responses within the system. Ecosystem reaction to stress is often expressed catastrophically through critical breakpoints that can only be determined retroactively. That a breakdown in a system is likely can be anticipated, but foretelling the actual time when it will occur is far more difficult. The closing statement of the report recognized that while many uncertainties remain, and continuing research and monitoring are required to fine tune the management process, the need for further information should not stand in the way of urgently needed action. Army Corps of Engineers; U. Environmental Protection Agency; U. I especially appreciate the time and teamwork contributed by the scientists that drafted the conference report: Ward and Robin Welcomme. Application of Ecological Knowledge to River Management. Conference and Workshop Summary.

Chapter 2 : eLearning River | Ideas. Technology. Theory. Practice.

RIP, Jim Harrison, whose novel, Legends of the Fall, made him nationally known for a time. A writer of the earth, who I discovered, living in Grand Rapids, Michigan, was living in the Leelanau Peninsula of the northern lower peninsula of Michigan.

Resisting floods by means of levees, dams, and channelization neglects inherent uncertainties arising from humanâ€"nature couplings and fails to address the extreme events that are expected to increase with climate change, and is thereby not a reliable approach to long-term flood safety. It derives from living with periodic floods as learning opportunities to prepare the city for extreme ones. The theory of urban resilience to floods challenges the conventional wisdom that cities cannot live without flood control, which in effect erodes resilience. To operationalize the theory for planning practice, a surrogate measureâ€"the percent floodable areaâ€"is developed for assessing urban resilience to floods. To enable natural floodplain functions to build urban resilience to floods, flood adaptation is advocated in order to replace flood control for mitigating flood hazards. The industrialized world has heavily relied on flood control to mitigate flood hazards, yet it is criticized for harming riverine ecosystems and increasing long-term flood risk Burby et al. Alternative management concepts have emerged, emphasizing the integration between land and water management and of structural and nonstructural measures e. Nevertheless, scholars continue to assert the indispensability of flood-control infrastructure for cities e. Designed and operated under an obsolete assumption that the pattern of flow variability remains unchanged over time Milly et al. Cities that depend on flood-control infrastructure can resist floods only up to a certain magnitude, thereby these cities are ill-prepared for capacity-exceeding extreme floods, which are expected to increase with more intense storms whose exact natures are unpredictable Alley et al. An alternative mitigation approach is needed, which this paper addresses by developing a flood hazard management concept that focuses on resilience. The idea of resilience has a long history in ecology and engineering, but its application to natural hazard management is relatively recent Berkes What defines resilience to floods remains ambiguous, despite the increasing attention given to the concept of resilience in flood hazard management. There are two major resilience interpretationsâ€"engineering resilience and ecological resilience Holling I explain why the latter is a more appropriate theoretical framework for management and for defining urban resilience to floods. In order to operationalize the theory for planning practices, a resilience surrogate measure is proposed for assessing urban resilience to floods. The theory and the measure together indicate that flood adaptation should replace flood control in order to build urban resilience to floods. Discerning their fundamental differences is important because they lead to divergent problem definitions, focuses, and approaches when applied to flood hazard management. Engineering resilience and ecological resilience In engineering, resilience is concerned with disturbances that threaten the functional stability of engineering systems, which are often linked with low probabilities of failures or, in the case of failure, quick recovery to normal levels of functionality Wang and Blackmore Such resilience depends on four properties: This engineering resilience concept encompasses both resistance to and recovery from disturbances, although the measurement is focused exclusively on recoveryâ€"the faster the full functionality is restored, the greater the resilience for example, Hashimoto et al. Engineering resilience thus emphasizes the ability to bounce back to the original condition when relaxed from stress Wang and Blackmore In ecology, Holling introduces the term resilience to describe observed ecosystem dynamics. It challenges the conventional ecological paradigm of equilibrium that assumes a predetermined stable state for every ecosystem, to which it eventually returns after a disturbance. Empirical studies show that some ecosystems never stabilize due to frequent disturbances. Multi-equilibria also exist when the ecosystem stabilizes after a disturbance but in a different state. It means the ecosystem is characterized by a different set of structures and processes, and returning to the previous ecosystem is extremely difficult if not impossible Holling , Scheffer et al. This ecological resilience concept focuses on persistence, or remaining within the same regime defined by the same processes, structures, feedbacks, and identity Walker et al. Because systems do not operate near equilibrium, resilience is associated with the change the system can tolerate and the ability to reorganize or renew Carpenter et al. It is measured by the magnitude of the disturbance the system can undergo before shifting to a different regime Gunderson and Holling In addressing different types of systems, several disparities exist between engineering and ecological resilience Table 1. They derive mainly from the different assumptions of system dynamics regarding the number of possible regimes Holling , Fig. The assumption behind engineering resilience, which is about maintaining the optimal state of functionality, is congruent with the ecological paradigm of equilibrium, presuming only one regime with an idealized stable state as the norm. The paradigmatic divergence reflects different perceptions towards normalcy. In the engineering resilience concept any change from the optimal state is deviant, while in the ecological resilience concept any fluctuation within the regime is normal because systems are inherently dynamic Holling Essentially, engineering resilience is the ability to maintain stabilityâ€"remaining unchanged in system state or having minimum fluctuation; whereas ecological resilience is the ability to survive, regardless of the state. They are two different, even contradictory, system properties. Systems with high engineering resilience may have low ecological resilience; low engineering resilience may introduce high ecological resilience Holling , Community resilience to natural hazards The two resilience concepts receive increasing attention in hybrid systems, such as socialâ€"ecological systems e. In natural hazard management, which deals with the interaction between humans and environmental fluctuations Mileti , engineering resilience prevails in current definitions of community resilience. Few authors define it without implying an optimal reference state, and it is frequently viewed as the capacity to withstand and recover quickly from disasters Table 2. For example, Birkland and Waterman propose three features of community resilienceâ€"damage prevention, speedy recovery, and preservation of community functionalityâ€"arguing that the more stresses the community can bear to preserve functionality, the faster the recovery is. Discussions on community resilience place an overwhelming emphasis on recovery e. In many cases, resilience is taken to mean exclusively the capacity to bounce back to the predisaster state, to differentiate from resistance, which means the ability to withstand a disturbance without disruption e. In flood hazard management, for example, resistance means flood prevention by flood-control infrastructure, while resilience is the rate of return from a flood-impacted state to the normal one De Bruijn Recovery is often interpreted as returning to predisaster conditions, implicitly assuming an optimal reference state, which nevertheless does not exist in coupled humanâ€"natural systems Berkes Urbanized floodplains are such systems, where climate, socioeconomic trends, built systems, and riverine processes affect flood hazards and disasters. They operate like evolving ecosystems rather than engineering systems and are characterized by complex behaviors associated with nonlinearity, emergence, uncertainty, and surprise Liu et al. Such dynamic systems will not stay at a predetermined state. To be sure, moving quickly from a chaotic state to an organized one after a disaster is paramount, but it is unconstructive to restore the predisaster socioeconomic activities and built environments that are vulnerable in the first place Klein et al. What remains unchallenged in this recovery notion is the preoccupation with stability. Stability becomes problematic when forced at temporal and spatial scales, at which the system is inherently dynamic Cumming et al. The ecological resilience concept is a more appropriate framework for flood hazard management, for it builds on a more realistic paradigm of multi-equilibria, focusing pragmatically on persistence in a world of flux Adger et al. Thanks to studies on integrated socialâ€"ecological systems e. It is instrumental for addressing flood hazards that arise from the interaction between riverine and urban dynamics. From maintaining stability to building resilience Two key arguments in resilience theory would shift the paradigm of flood hazard management. First, resilience arises from adapting to inherent variability, uncertainty, and surprise Folke Coupled humanâ€"natural systems lose resilience when the inherent variability is artificially suppressed to promote stability through command-and-control management Holling and Meffe , Holling et al. This suggests that forcing floodplains to be inundation-free and building socioeconomic functionality upon forced environmental stability results in resilience erosion. It thus challenges the bias towards maintaining a dry floodplain and steady socioeconomic activities. Flood hazard management based on resilience theory would begin with acknowledging periodic floods as inherent environmental dynamics, by which socioeconomic activities on floodplains are inevitably affected. Secondly, resilience theory holds that periods of gradual development and sudden changes complement each other Folke As demonstrated in frequently disturbed ecosystems, resilience is borne out of experiencing and learning from disturbances Holling , Gunderson and Holling Research into communities relying on natural resources also indicates that resilience to large, unpredictable disturbances derives from allowing smaller ones to enter the system Berkes and Folke , Berkes et al. It suggests that flooding itself is an agent for resilience because each flood experience creates a chance for cities to adjust internal structures and processes and to build knowledge, leading to diverse coping strategies cumulated over time Folke , Smit and Wandel This contrasts with the attitude toward floods as being threatening, idiosyncratic events that legitimize flood control. As flood-control infrastructure prevents most floods, cities only learn painfully from rare, catastrophic ones with high prices. In the resilience-based flood hazard management, periodic floods are learning opportunities for cities to become better fit for extreme floods. Overall, resilience theory suggests a paradigm shift in flood hazard management that should focus on building resilience as opposed to maintaining stability. Because flooding is inherently a part of the normal urban dynamics, resilience is neither flood resistance nor recovery to predisaster conditionsâ€”both are simply means to an end of stability. Here, resilience is the tendency to survive, which is itself an end. The resilience of ecological systems is concerned with system collapse; yet such a concern for cities is almost irrelevant, as history shows that most cities that have experienced catastrophic destructions have persisted and even flourished Vale and Campanella A city remaining as a city means little to those who have lost their lives and to those forced into permanent hardship Klein et al. Moreover, individual people matter in hazard management, although individual creatures are irrelevant to ecological systems that build resilience through system-level adaptation where less-fit individuals are continuously replaced Gunderson Thus, urban resilience to floods encompasses dual concerns: A definition Resilience theory has been applied to community resilience, stressing the capacity to absorb recurrent hazard impacts and reorganize while undergoing change so as to maintain fundamental structures, processes, identity, and feedbacks Table 3. Likewise, urban resilience to floods is defined as the capacity of the city to tolerate flooding and to reorganize should physical damage and socioeconomic disruption occur, so as to prevent deaths and injuries and maintain current socioeconomic identity. It can be conceptualized as the capacity to remain in a desirable regime while experiencing a flood. Urban resilience to floods is measured by the flood magnitude the city can undergo until it reaches a threshold and shifts to an undesirable regime. Unlike that for biophysical systems, a regime is socially rather than scientifically defined. The undesirable regime is characterized by significantly reduced resources and assets, large-scale population displacement, livelihood disruption, and loss of security Adger , Berkes et al. Once in it, moving to a better regime or developing a socioeconomic identity similar to the previous one is costly or impossible. Essentially, urban resilience to floods is the capacity to avoid flood disaster. If damage and disruption had occurred, remaining in the regime counts on reorganizationâ€”reestablishment of socioeconomic order. While the return to preflood conditions is irrelevant, the speed of reorganization matters because prolonged socioeconomic disruption can eventually push the city into an undesirable regime Walker and Westley Overall, urban resilience to floods is defined by floodability and reorganization, not flood resistance and recovery that engineering resilience would suggest. Key properties Resilience is frequently associated with self-organization, adaptive capacity, and redundancy Carpenter et al. Self-organizing systems are resilient to disturbances because of the distributed character Heylighen Adaptive capacity can increase resilience over time, as it is associated with learningâ€”the ability to adjust to changing internal demands and external conditions Gunderson , Carpenter and Brock Redundancy provides insurance against total system failure. These concepts can be translated into the following key properties of urban resilience to floods. Localized flood-response capacity Self-organizing cities, where each citizen and public manager could act immediately to avoid damage, are more agile in coping with flooding and are thus more resilient than cities that rely on centralized mechanisms such as flood-control infrastructure. If disrupted, they can also quickly reorganize because of the internal ability to clean up and fix damage without waiting for external help from the central government or aid agencies, which do not always act soon enough. Timely adjustments after every flood The adaptive capacity contributing to increasing urban resilience to floods is associated with the ability to learn from each flood, i. Every flood entails something new, e. By understanding new phenomena and making necessarily adjustments, the city incrementally increases floodability. It is a learning-by-doing process, where novelty is involved in the adaptation to avoid repeating the previous configuration Walker et al. Redundancy in subsystems Here, redundancy is more than duplication of the same element in an engineering sense, e. It entails diversity and functional replication across scales Peterson et al.

Chapter 3 : - The Theory and Practice of Rivers and New Poems by JIM HARRISON

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