Restoration and conservation of watershed ecosystems: linking ecology, hydrology and geology

Organizer: Itsuro Koizumi (CRIS, Hokkaido University)

Date: 4-5 October 2010

Place: Room D201 at the Faculty of Environmental Earth Science, Hokkaido University

Supported by L-station at CRIS, Hokkaido University

Stream networks and watershed systems are among the most vulnerable ecosystems to human impacts such as habitat fragmentation, water pollution, logging and flow regime alterations. Loss of ecosystem functions and extinction of freshwater and riparian species have become serious issues. To understand biological processes in watershed ecosystems we need to understand hydrological and geological processes that create biological habitats. Conservation biologists, however, have been focusing mostly on single species or communities and have neglected the dynamic nature of the habitats. Since human activities have been altering geological and hydrological processes at an unprecedented speed, biologists should learn abiotic processes as well.

This symposium would provide a good opportunity for biologists, hydrologists and geologists to get together and discuss toward comprehensive understanding of watershed ecosystems for effective restoration and conservation. Researchers from northwest US are presenting some examples of interdisciplinary approaches and their strengths and challenges. In this symposium, I am looking forward to stimulating discussions for fruitful future collaborations.

Schedule

October 4, Monday

10:00-10:15 Introduction (I. Koizumi)

10:15-11:00 GIS as a tool to link geomorphology, stream ecology and river conservation (H. Imaki)

11:00-11:45 Process-based principles for restoring river ecosystems (T. Beechie)

11:45-13:00 Lunch

13:00-13:45 Hydrogeomprphic processes and stream ecosystems in headwaters: The key component to forest and watershed management (T. Gomi)

13:45-14:30 Ecological assessment of flow regime in rivers at catchment scale (C. Yoshimura)

14:30-16:00 Short presentations (six people, see next page)

16:30-17:15 A review of the Pacific salmon hatchery programs on Hokkaido Island, Japan. (K. Morita)

17:15-18:00 Ecosystem alteration by parasite: implication from a riparian ecosystem. (T. Sato)

19:00-endless Dinner at Izakaya (Japanese style bar, “Tengu-no-kura” Kita-13, Nishi-3)

October 5, Tuesday

10:00-10:45 River restoration in the Pacific Northwest US: simple solutions, complex realities (J. Dunham)

10:45-11:30 Multidisciplinary approaches to understand floodplain ecosystems (J. Negishi)

11:30-13:00 Lunch

13:00-13:45 Habitat analysis and evaluation of freshwater fish in Japan: The effect of watershed development and habitat fragmentation by dam (S. Kameyama)

13:45-14:30 Human land use and the endangered, largest salmonid, Sakhalin taimen (K. Nomoto)

14:30-15:00 Discussion

October 6, Wednesday: GCOE special lecture

15:00-15:45 Climate change and fish in the Pacific Northwest US: focus on water temperature (J. Dunham)

15:45-16:30 Restoring rivers in a changing climate (T. Beechie)

Short presentations: October 4, 14:30-16:00 (5-15 minutes per person including Q&A)

・Effects of heavy metals on riverine macroinvertebrates (Y. Iwasaki)
・River confluences enhance riparian vegetation and plant species diversity (T. Osawa)
・Determinant factors in structures of a fish community in a middle reach of a stream: the approach by year-round monitoring of a fish community and physical environments of a stream (H. Nakagawa)
・Effects of turbid water on periphyton vary with velocity (Terutaka Mori)
・Thinking about evolution and conservation in cyprinid fishes - approaches from life history studies in creeks and ponds (Noriyasu Suzuki)
・Determinant factors for the community structure of stream fishes: physical environments vs. spatial factors (Chitose Yamazaki)

Relevant publications:

Beechie et al. (2010) Process-based principles for restoring dynamic river systems. BioScience 60: 209-222.

Gomi et al. (2002) Understanding processes and downstream linkages of headwater systems. Bioscience 52:905-916.

Morita et al. (2006) A review of the Pacific salmon hatchery programs on Hokkaido Island, Japan. ICES Journal of Marine Science 63: 1353-1363.

Kameyama et al. (2007) Spatio-temporal changes in habitat potential of endangered freshwater fish in Japan. Ecological Informatics 2/4: 318-327.

Sato et al. (2008) Parasite-mediated allochthonous input: Do hairworms enhance subsidized predation of stream salmonids on crickets? Canadian Journal of Zoology 86:231–235.

Sato et al. (2010) Nematomorph parasites drive energy flow in through a riparian ecosystem. Ecology (in press)

Iwasaki et al. (2009) Effects of heavy metals on riverine benthic macroinvertebrate assemblages with reference to potential food availability for drift-feeding fishes. Environmental Toxicology and Chemistry 28: 354–363.

Yoshimura & Kawaguchi (submitted) Spatial distribution of flow regime and its relationship to fish species richness in major rivers in Japan.

Osawa et al. (2010) High diversity at network nodes: river confluences enhance vegetation diversity. The Open Ecology Journal: 48-58.

Osawa et al. (2010) River confluences enhance riparian plant species diversity. Plant Ecology 209:95-108.

Websites of participants

Beechie, Tim:http://www.nwfsc.noaa.gov/research/staff/display_staffprofile.cfm?staffid=204

Dunham, Jason: http://fresc.usgs.gov/staff/profile.asp?Emp_ID=720

Gomi, Takashi: http://kenkyu-web.tuat.ac.jp/Profiles/26/0002542/profile.html

Imaki, Hiroo: http://www.geopacific.org/

Iwasaki, Yuichi: http://yuichiwsk.web.fc2.com/

Kameyama, Satoshi: http://www-basin.nies.go.jp/member/kameyama.html

Koizumi, Itsuro: http://www.cris.hokudai.ac.jp/koizumi/

Morita, Kentaro: http://cse.fra.affrc.go.jp/moritak/

Negishi, Junjiro: http://www.geocities.jp/watershed_con_man/

Osawa, Takeshi: http://osawa.nomaki.jp/index.html

Yoshimura, Chihiro: http://www.cv.titech.ac.jp/~yoshimura-lab/yoshi/index.htm

Accommodations (reasonable, in the vicinity to Hokkaido University):

Buisiness Inn Norte II:

Very reasonable with sufficient facilities (incl. Internet). From 3,800JPY

Kita-10, Nishi-4, Kita-ku, Sapporo, Hokkaido 001-0010, TEL：011-707-0066

http://www.b-norte.jp/norte2/

Toyoko Inn:

A standard hostel. From 5,985JPY (incl. simple breakfast and dinner)

Kita-8, Nishi-4, Kita-ku, Sapporo, Hokkaido 060-0808, TEL：011-728-1045

http://www.toyoko-inn.com/hotel/00066/

Sapporo Aspen Hotel:

Very comfortable, high cost performance. From 5,500JPY

Kita-8, Nishi-4, Kita-ku, Sapporo, Hokkaido 060-0808, TEL：011-700-2111

http://www.aspen-hotel.co.jp/

Restaurants (Sapporo is one of the best places!):

Izakaya (Japanese bar): Tengu-no-kura (Kita-13, Nishi-3), Kanro (Kita-8, Nishi-1), Wagao (N7W7), Kazaguruma (Kita-17, Nishi-4)

Soup curry (Highly recommended!): Picante (Kita-13, Nishi-3, very good but crowded), Kokoro (Kita-15, Nishi-4), Suriyotai (Kita-11, Nishi-3, Thai curry, cheap), Chelsea (Kita-11, Nishi-3)

Others: Densuke (Kita-13, Nishi-3, Japanese traditional style, highly reccommended!), Marutaka (Kita-11, Nishi-4, Noodle), Chin-man (Kita-10, Nishi-4, Chinese)

Map around Hokkaido University:

記

１．国際シンポジウムタイトル

Restoration and conservation of watershed ecosystems: linking ecology, hydrology and geology

２．日程

2010 年 10 月 4－5 日（4 日 10－18 時、5 日 10－15 時）

３．場所

- シンポジウム：北海道大学地球環境科学院 D201 号室
- 懇親会：てんぐの蔵（北区北 13 条西 3 丁目、会場から徒歩 10 分以内）、4 日 19 時から
  学生 2,000-3,000 円、学生以外 5,000-6,000 円、　＊＊当日参加不可＊＊

４．目的

- 生態学、水文学、地形学の研究者を集めて今後の学際研究に繋がる人脈ネットワークを形成する
- 海外から第一線の研究者を招待して、日本の研究および河川管理システムとの違いを比較。これにより、日本の今後の課題・方向性を明らかにする。
- シンポジウムと相補的に現地調査を組み入れることにより、具体的なフィールド研究の発展に繋げる
- 国際研究発表の機会を大学院生に提供する

５．講演予定者と内容

5-1. 一般講演（質疑応答込み、一人 45 分）

・Tim Beechie (NOAA、シアトル) 『河川生態系のプロセスベース管理』
・Jason Dunham (USGS、オレゴン)『北米における河川復元の取り組み』
・今木洋大（NOAA、シアトル）『地形、河川生態、保護管理を統合するための GIS ツール』
・亀山哲（国立環境研究所）『日本全国を対象とした淡水魚類の生息地解析と評価: 流域開発とダムによる生息地分断の影響』
・五味高志（東京農工大・農）『水文地形プロセスと山地渓流の生態系:森林と流域管理のキー要素』
・佐藤拓哉（京大・理）『寄生者が改変する生態系：河畔生態系からの示唆』
・根岸淳二郎（北大・環境科学院）『氾濫源生態系を理解するための学際的アプローチ』
・野本和宏（北大・環境科学院）『土地利用形態が絶滅危惧種イトウに及ぼす影響』
・森田健太郎（水研センター・釧路）『北海道における孵化放流事業のレビュー』
・吉村千洋（東工大・理工）『流域スケールにおける流況の生態的評価』

5-2. ショートプレゼンテーション（一人 5-15 分）

- 岩崎雄一（東工大、理工）『亜鉛等重金属が河川底生動物に及ぼす影響』
- 大澤剛士（農環研）『河川の合流が河川性植物の多様性を高める』
- 鈴木規慈（三重大・生物）『コイ科魚類における進化と保全を考える - 水路およびため池における生活史研究からのアプローチ』
- 中川光（京都大学・理）『河川中流域における魚類群集の構造決定要因：魚類群集と河川物理環境の通年モニタリングによるアプローチ』
- 森照貴（土木研）『濁水が付着藻類に及ぼす影響は流速に依存して変化する』
- 山崎千登勢（北大・フィールド）『河川性魚類の群集構造決定要因：物理環境と空間的要因からの考察』

６．備考

- 気楽で楽しいシンポジウムを目指す。人的交流が最大の目標。
- 専門分野の異なる研究者が集まるため、講演内容は専門的なものよりは当該分野の概念を伝えるレビュー的なものが望ましい。
- ショートプレゼンテーションは自分の研究紹介の場。形式は自由。国際発表の練習にも。
- 基本的に英語のシンポジウムだがディスカッションをより効果的にするために、必要な時は日本語の使用も可とする。

以上

Abstracts from invited speakers from USA

GIS as a tool to link geomorphology, stream ecology, and river conservation

Hiroo Imaki

Spatial information plays a critical role in all aspects of conservation including basic ecological data storage, data analysis, ecological modeling, conservation planning, and public involvement. Recent rapid advancements in computer and geographic information systems technologies provide exciting opportunities to integrate all aspect of stream conservation with spatial information. Currently, we are developing a stream GIS dataset that identifies historic riparian vegetation communities, potential channel types, and historic salmon distributions; this dataset covers the entire Columbia River basin (668,000 km^2) with a 200 m reach resolution. With the dataset, users can implement processed-based stream restoration principles on a watershed scale and prioritize restoration projects across the entire basin. In addition to these technical capabilities, GIS also can provide the indispensable capability of visualizing complex science data for the public. We recently visualized climate change impacts on flow regime and various restoration scenarios in the Snohomish river estuary. Our stream dataset and visualizations are providing vital information for conservation practitioners and exemplify a seamless transition from science to conservation on the ground.

Process-based principles for restoring river ecosystems

Tim Beechie

Process-based restoration aims to re-establish normative rates and magnitudes of physical, chemical, and biological processes that sustain river and floodplain ecosystems. Ecosystem conditions at any site are governed by hierarchical regional, watershed, and reach-scale processes controlling hydrologic and sediment regimes; floodplain and aquatic habitat dynamics; and riparian and aquatic biota. We outline and illustrate four process-based principles that ensure river restoration will be guided toward sustainable actions: (1) restoration actions should address the root causes of degradation, (2) actions must be consistent with the physical and biological potential of the site, (3) actions should be at a scale commensurate with environmental problems, and (4) actions should have clearly articulated expected outcomes for ecosystem dynamics. Applying these principles will help avoid common pitfalls in river restoration, such as creating habitat types that are outside of a site's natural potential, attempting to build static habitats in dynamic environments, or constructing habitat features that are ultimately overwhelmed by unconsidered system drivers.

River restoration in the Pacific Northwest US: simple solutions, complex realities

Jason Dunham

The Pacific Northwest US represents an area of very high activity with respect to river restoration, with hundreds of millions of dollars invested annually in efforts across the region. Most efforts have focused on benefitting Pacific salmon and trout - species that have great capacity to be resilient in the face of variable environments. In spite of massive restoration efforts these species have responded much slower than we would like. Why is this? I discuss selected reasons for this, including 1) lack of understanding of the benefits of restoration, 2) failure of restoration to address key natural processes, and 3) failure of restoration to address key unnatural processes. The implication is that we often find ourselves treating superficially obvious symptoms that are part of larger and much more complex problems. Addressing this reality is much easier in a seminar than in practice, but acknowledging the problem is the first step to a more effective solution. I hope the examples discussed here will provide the basis for some interesting discussion in the symposium.