

Case Survey and Review on the Restoration of Small River

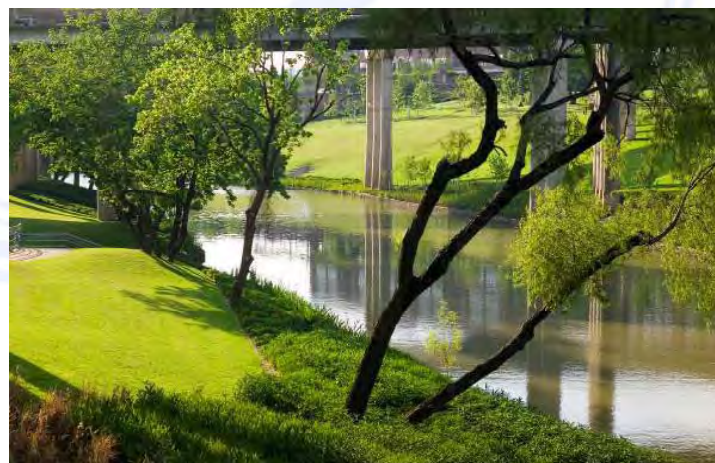


Prof. Wang Xiaosong
Dept. of Hydraulics, IWHR
2013
Chengdu

OUTLINE

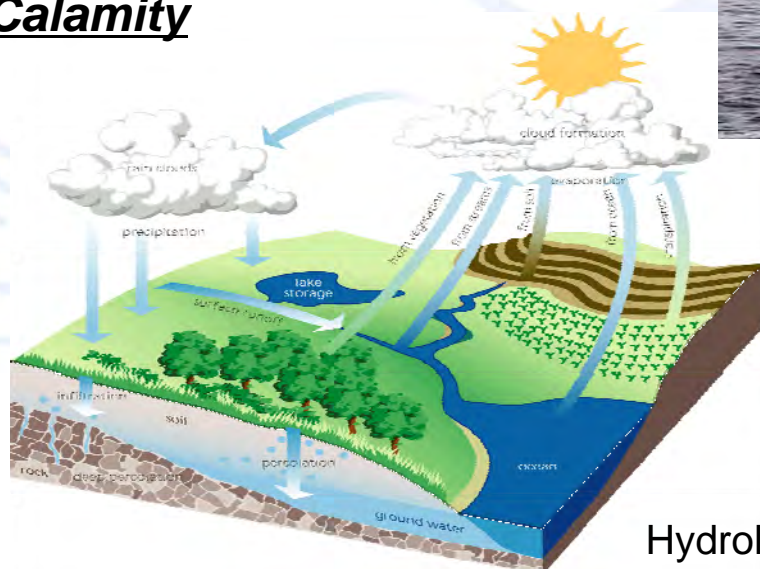
- 1 Background
- 2 Planning
- 3 Implementation
- 4 Major Achievements
- 5 Lessons





Global problems

- Population
- Environment
- Resources
- Calamity



Hydrological cycle

Floods



Urban Storm Flood



2004-07-10

Beijing

2011-06-23

2012-07-21

Major Causes of Flooding

- **Seven major river basin**
- Highly Developed Area
- Intensity and Duration of Rainfall
- Little Storage
- LID or BMP



Urbanization

Rapid development, Excessive exploitation and Urbanization
Degradation of the water system

Adverse Impacts of Urbanization:

- Expansions (floodway developments)
- Constrictions (bridge crossings)
- Realignments (cutoffs, restoration)
- Changes in resistance (dikes, weirs, riprap..)
- Diversions (water intakes)
- Dams and grade control structures
- Deforestation (sediment supply)
- Impervious cover(increasing runoff).
- Increased nutrient loads(water quality is deteriorated)
- Increased bank erosion
- Decrease in quality of aquatic habitat in streams



Clarifying Problems



The reality is so challenge !!!

- What's happening?
- What are the problems?
- Where are they coming from?
- What and how much do we need to do?
- How will we do it?
- Who's going to do what, how, when, & with what?
- How will we know if we made it?



In 2008 and 2009, the central government launch the huge and widespread projects to strengthen the restoration of small and medium-sized rivers.

Ministry of Treasury and Ministry of water resources jointly issued a series of documents.

The short term restoration plan for small and medium-sized rivers in key regions outline the followings:

- Stage requirements
- Preliminary work
- Efficient use of funds
- Implementation
- Management
- Project acceptance
- Supervision



River net



The basin area between **200-3000 km²**

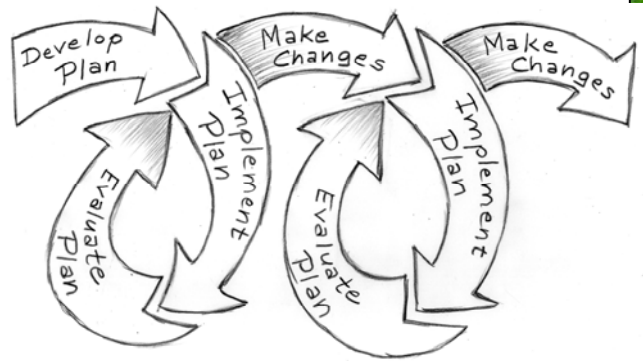
So many towns and villages farmland along the river

Flood control (reservoir reinforced, river restoration)
Geological disasters mitigation (flash flood, debris flow)
Water and soil conservation



Process

- Know needs
 - Identification of goals/objectives
 - Stakeholder involvement
- Know the situation
 - Characterization analysis and Assessment
 - Issue identification
- Know what can be accomplished
 - Plan implementation and adaptat
 - Measures and approaches
- Know how to achieved
 - Adaptive management
 - Tracking progress



Prioritized Objectives

Minimize Risks:

- ✓ Mitigat Flood threat

Minimize Impacts:

- ✓ Enhance the capability of flood control

Minimize Loss:

- ✓ Standard of flood control

Improve the environment for the public interest:

- ✓ Maintain Recreation and Aesthetic Enjoyment

Preliminary improved ecological environment

Preserving the environmental and cultural values



According to the central and local financial resources, comprehensively considered the disaster situation in different regions, General plans approved by the State Council put forward five years goals and tasks, the priorities and the scale of investment. More than 5000 small and medium-sized rivers involved.

2009~2015:

Rivers: 5174

Projects: 9243

Cover Length: 67,500 km

Investment: 186 billion yuan

Phase I – 2209 river completed before 2013

Cover Length: 27,500 km

Phase II – Extra 2965 river to be undertaken during 2013~2015

Cover Length: 40,000 km



before restoration



after restoration

Merced R. Robinson reach



Houston river US

Principals being pursued

- **Focused :**
- Flood prone, Dense population, Important protection objects and infrastructure
- **Balanced :**
- Flood control and water resources utilization
- Development, protection and restoration
- Construction and management
- **Maximizes short- and Long- term benefits**
- **Be cost-effective**
- **Receives broad public and agency support**



Priority Stream Restoration Sites

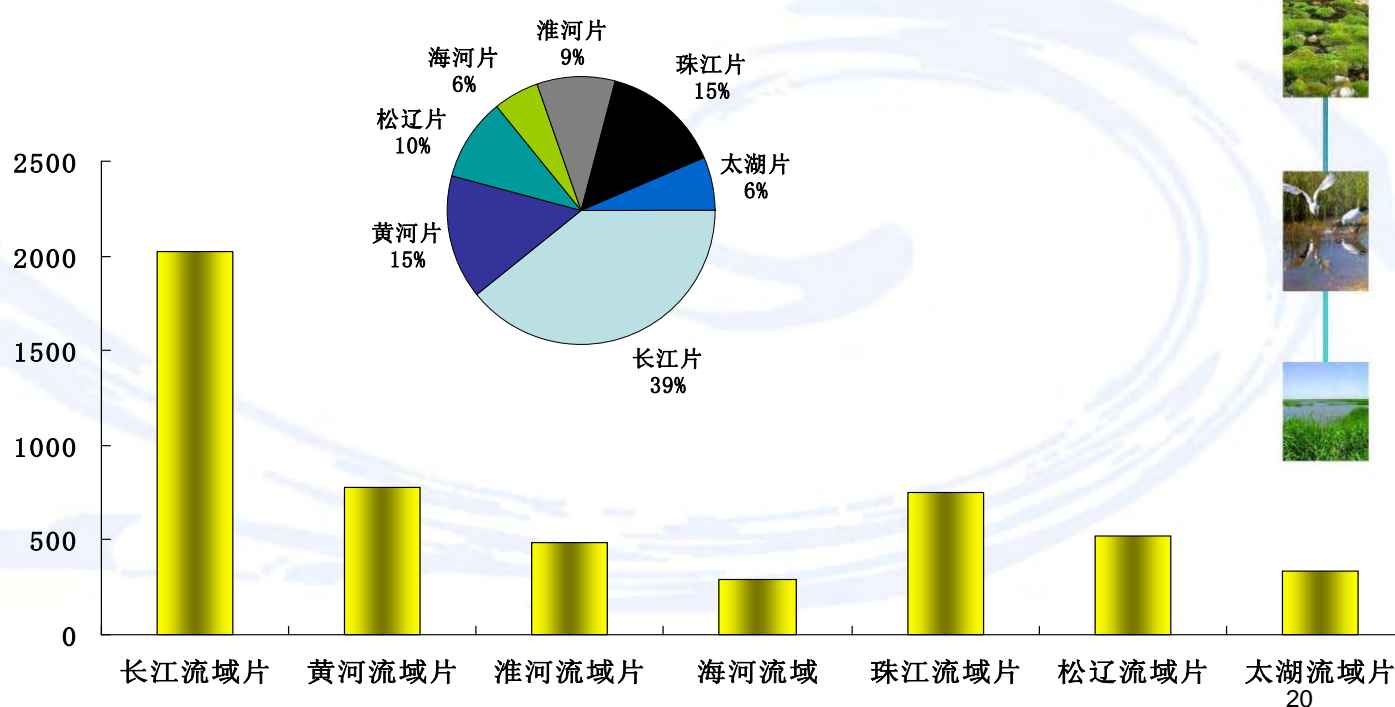
- Rural areas and less developed areas
- Frequent and seriously affected by flood hazards
- Flood control standards low
- Ecological environment being serious impaired
- Requirements of local have high urgency
- The comprehensive benefit is remarkable
- Special fund support
- Investment scale under controlled



Distribution of pilot projects



Key Regions Distribution of the 5174 Rivers



Project implementation

Ministry of water resources pay close attention to the implementation, held a series of work meeting to map out the work plan for the coming period, make explicit demands for action.

1. Scientific and reasonable plan formulation.
2. Highlight the function of flood control of engineering.
3. Emphasize to the application of ecological technique.



- Improve the responsibility
- Initial pilot work
- Increased investment
- Strengthening the training
- Renew the idea
- Strengthen inspection

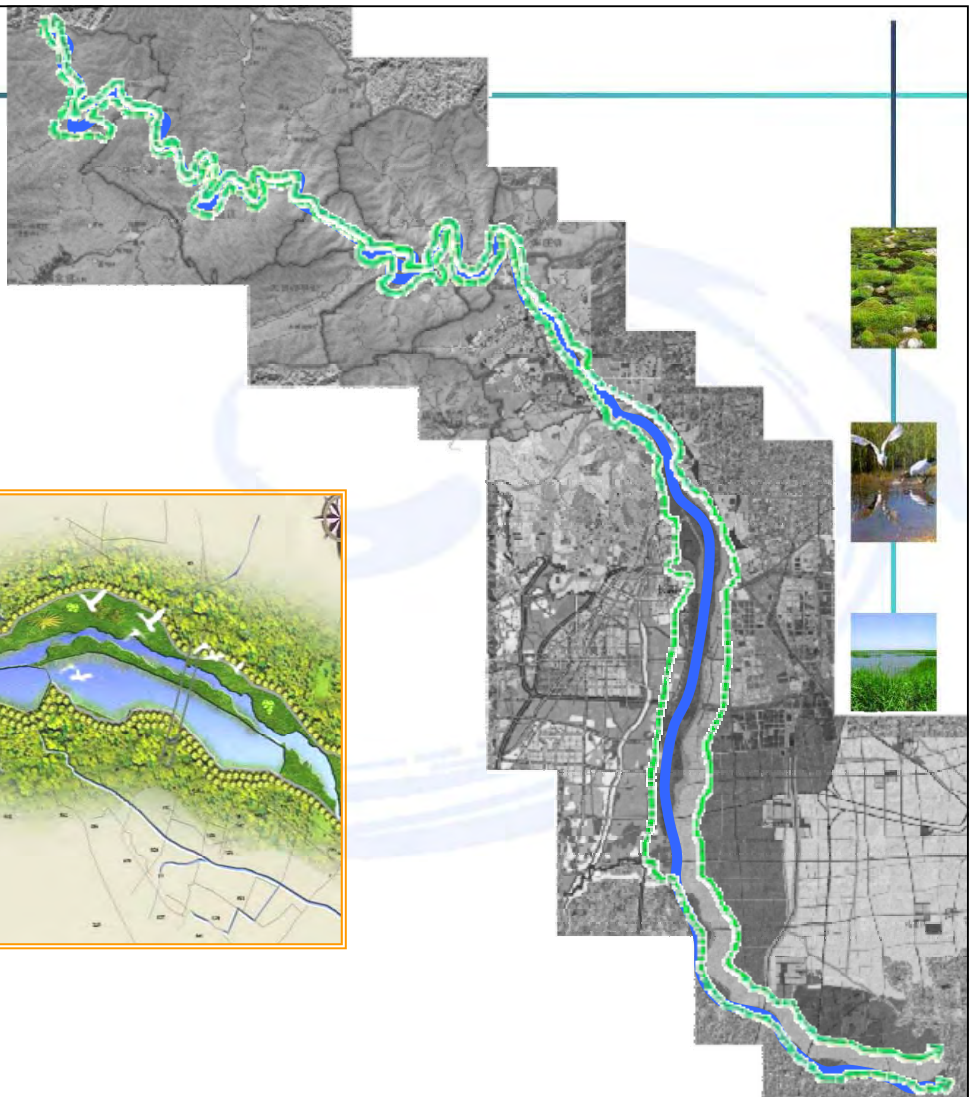


Achievements

Successful completion of the tasks in the short terms.

Up to the end March, 2013

- 1. 25,200 km river have been renovated.**
- 2. Meet the national standard of flood control.**
- 3. Investment 55.3 billion yuan.**
- 4. Benefit 120 million people and 8 billion hectares cropland from flood threat.**



Shenzhen

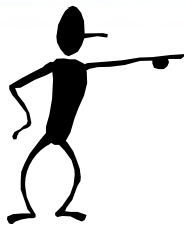


Demonstration projects



Case Survey

The restoration is a process to explore. Since its launch in 2009, The projects draw the attention and concern of all parties. To know more deeply, some problems concerned need further study. Four investigation teams organized. special investigation aim at summarizing the experience and successful practices, draw lesson from the past practices, provide the basis for subsequent project conduct more effective.



Investigation focus on different sides:

- ❑ Anhui: relation between the lowland plains and main stem
- ❑ Hunan: land reclaimed in lakeside
- ❑ Zhejiang: flood control and drainage standards
- ❑ Shanxi : sediment-laden river



Pitfalls or Lessons

1. River natural features and various flow condition, Project is not tailored to scale
2. Rivers channelization and disconnecting of natural rivers
3. Inadequate evaluation and study in the initial phases
4. Goals of action items ambiguous
5. Planning river restoration from the viewpoint of the basin
6. Coordination at the watershed level, Lack of consistency
7. Balance between flood control, environmental, economic, social aspects. Occupy river
8. Quality and schedule control
9. Money shortage , influence the full play of the engineering benefit



Lessons



- Impose changes in channel characteristics locally will cause changes upstream and downstream. Should estimate the extent and magnitude of induced changes.
- Approaches adapted should consider the local conditions and the technical level
- Letting a river restore its own original cycle of water, with its own natural power, by minimizing the influence of human activity.
- Nature oriented river should have multi functions such as: flood control, ecological recovery , aesthetics and amusement.

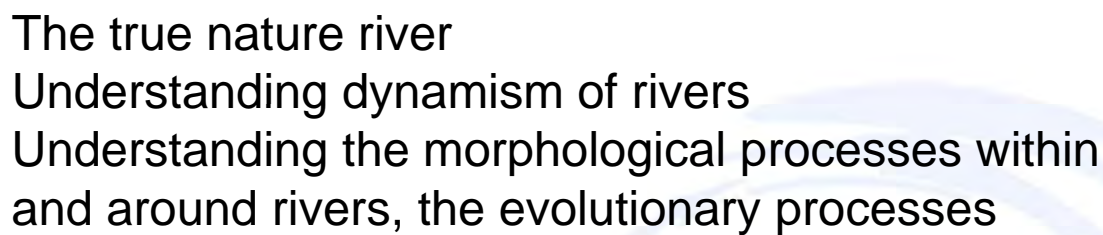
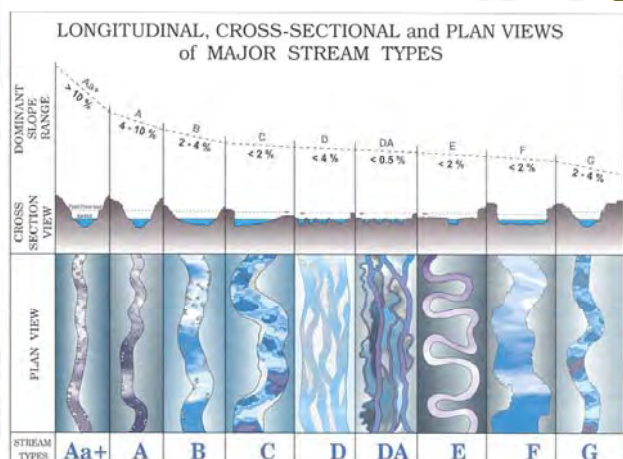
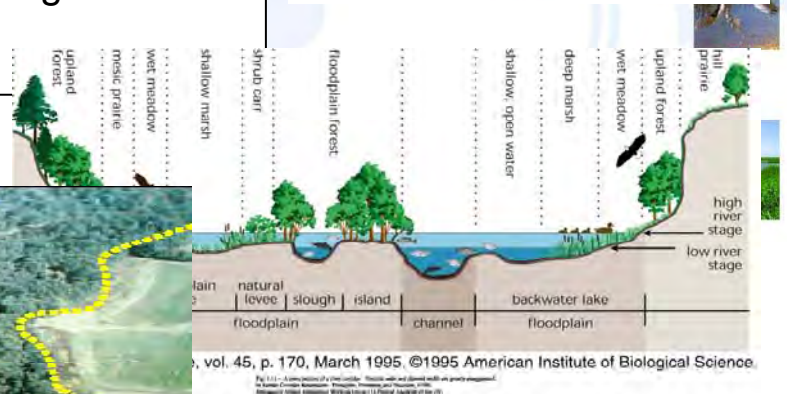
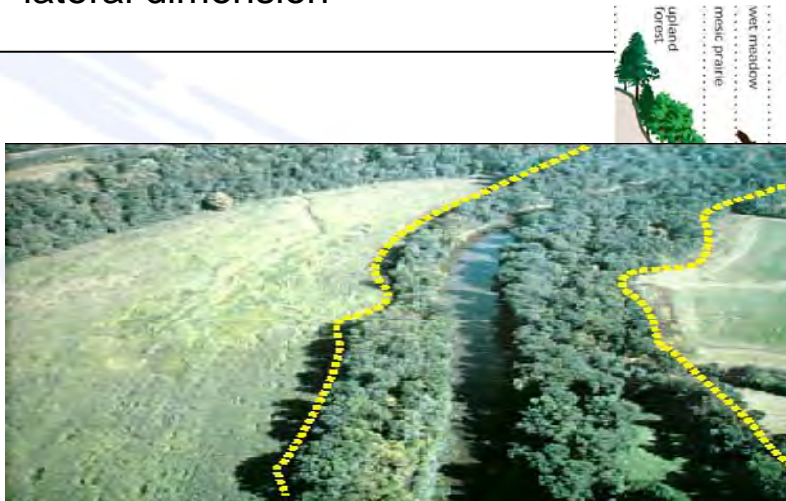
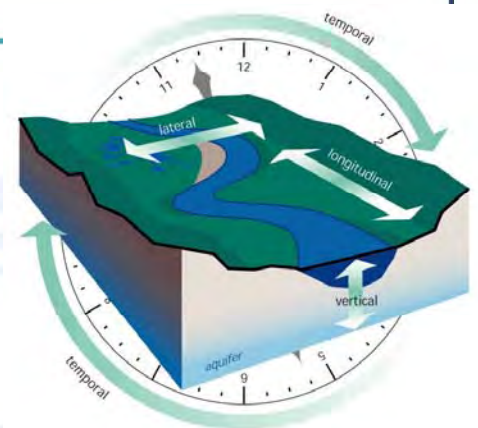


Fig. 1.27 – Three longitudinal profile views.
 In: *Stress (Tension) Reduction: Principles, Processes, and Practices*, 1998.
 Copyright Stress Reduction Working Group (13 Federal Agencies of the US).



- Four-dimensional framework
 - Longitudinal
 - Lateral
 - Vertical
 - Temporal
- Initial reaction is focus on the longitudinal,
- Neglect the physical structure along the lateral dimension



Straightening, reinforcement, channelization, and disconnecting processes still taken place.



Landscape and Historic value



The natural, historical, and cultural aspects



How awful is a river without water !

A saying from ancient Egypt

*To see a world in a grain of sand
And a heaven in a wild flower,
Hold infinity in the palm of your hand
And eternity in an hour.*

William Blake



Thanks for your attention!

