

# Stream Restoration Education and Professional Development: Working Toward a Consensus

ASCE Stream Restoration Educational Materials  
Task Committee

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Rose-Hulman Institute of Technology

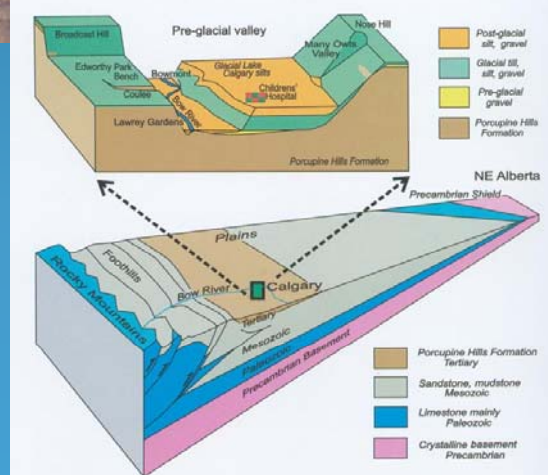
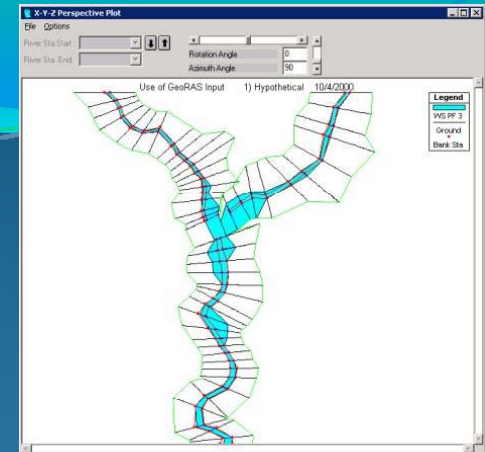


# Introduction

- Who are we?
  - ASCE Hydraulics and Waterways Council, River Restoration Committee
    - ASCE Stream Restoration Educational Materials Task Committee
      - Chair: Sue L. Niezgoda
      - Vice-Chair: Donald Carpenter
      - Secretary: John Schwartz
      - Members:
        - Clayton Anderson, Janine Castro, Jeffrey Clark, Jeff Marr, Joanna Curran, Garey Fox, Will Harman, Peggy Johnson, Greg Koonce, Christine Pomeroy, Dave Rosgen, Jack Schmidt, Andrew Simon, Louise Slate, Peter Wilcock, Tess Wynn

# Introduction

- Restoration is Multi-Disciplinary
  - Engineering, Geology, Fisheries Biology, Landscape Architecture, etc.
- Professional Certification or Licensure
  - Engineering – PE License – NCEES
  - Geology – PG License – ASBOG
  - Fisheries Biology – AFS Certification
  - Landscape Architecture – LA License – ASLA and CLARB



Bow Valley and regional geology, diagram: Terry Poulton, GSC

# Professional Certification and Licensure



- Professional Engineering License (NCEES)
  - Graduate from ABET Program
  - Fundamentals of Engineering Exam
    - **minimum level of competence**
  - Four years of professional experience under a PE
  - Pass the Principles and Practices of Engineering Exam
- *Professional licensure protects the public by enforcing standards that restrict practice to qualified individuals who have met specific qualifications in education, work experience, and exams.*

**Do you see anything unusual  
about this picture?**



# How about now?



**How about now?**





# Three People Died – No Inspection Program

ASCE Code of Ethics (Fundamental Canon #1)

**UNACCEPTABLE!**

Engineers shall perform services only in areas of their competence. Engineers shall undertake to perform engineering assignments only when qualified by education or experience in the technical field of engineering involved.

Engineers shall hold paramount the safety, health, and welfare of the public and shall strive to comply with the principles of sustainable development in the performance of their professional duties.



# Professional Certification and Licensure

- Professional Geologist
  - Degree in Geology or Related Geologic Science
  - Fundamentals of Geology Exam
    - **minimum level of competence**
  - Earn five years experience working with a PG
  - Pass the Practice of Geology Exam (ASBOG)
  - *Promote the profession of geology and to provide a framework for establishing standards of excellence*



*National Association of State Boards of Geology*

# Professional Certification and Licensure

Degree	Experience Requirements
Bachelor of Science, Bachelor of Arts or equivalent degree	five years of full-time qualifying experience, post-bachelor's degree.
Master of Science, Master of Arts or equivalent degree	four years of full-time qualifying experience, post-bachelor's degree.
Doctor of Philosophy or equivalent degree	two years of full-time qualifying experience, post-bachelor's degree.

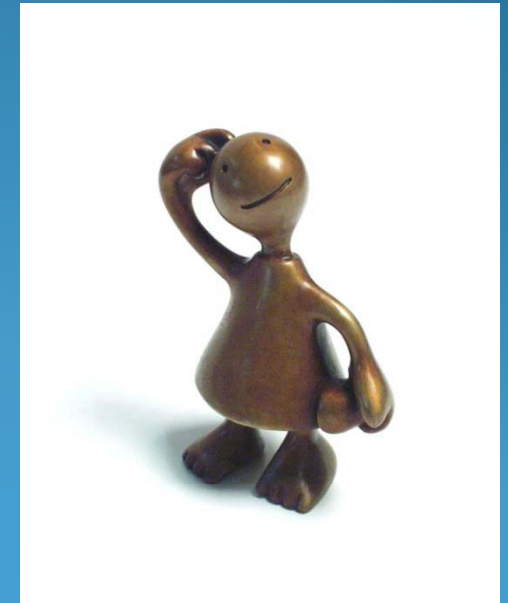
- Fisheries Biology
  - American Fisheries Society – Certification
    - Fisheries Professional Associate
      - **meet minimum education requirements**
    - Fisheries Professional Certified – meets minimum education, professional development, and experience requirements
  - *(1) to provide . . . a definitive minimum standard of experience and education for fisheries professionals; and (2) to foster broader recognition of fisheries professionals as well-educated and experienced, acting in the best interest of the public.*

# Professional Certification and Licensure

- Common Theme?
  - **Minimum Level of Education or Competence to Practice**
- The Practice of Stream Restoration
  - What defines a minimum level of competence to practice multi-disciplinary stream restoration?
    - How have you received your restoration training?
      - University or Short Courses, Conference Presentations, On-the-job training
    - How do you know which course to take?
      - Content?, Format?, Evaluation of Learning?

# ASCE Task Committee Goals

- Goals:
  - Developing a recommended curriculum based on needs
  - Identifying educator traits suited to cover that curriculum
  - Developing logistics to effectively disseminate information
- Why are we doing it?
  - Advance the quality of restoration planning, design, implementation, monitoring, and management
  - Clarify the education/training needs of professionals
  - ***Establish minimum level of competence for practicing professionals***





# Prior Studies

- RRNW, Oregon State, Portland State (2003)
  - Survey - assess job tasks, educational backgrounds, training needs of professionals in the northwest
    - Multidisciplinary training - in ecology, geomorphology, fisheries, and soils
    - Fisheries biologists /civil engineers greatest range across disciplines
    - Top areas for additional skills:
      - Geomorphology, field techniques, restoration techniques, biology/ecology
      - **Field experience most important!**
    - Results were region specific and left questions on logistics



PORTLAND STATE  
UNIVERSITY





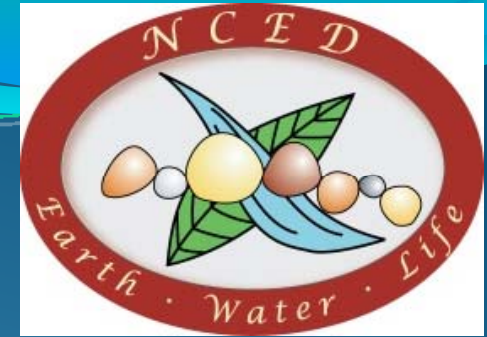
American Fisheries Society

# Prior Studies

- AFS Bioengineering Section (2003)
  - TC to identify BS and MS curricular needs
  - BS Level – math, physics, chemistry, biology, ecology, geology, and engineering fundamentals
  - MS Level – theoretical and field based courses in river processes and restoration, sustainable watersheds management, experimental design, data collection, field techniques, and thesis project
  - Great for university curriculum, but what about the practicing professional?



# Prior Studies



- National Center for Earth Surface Dynamics (NCED, 2006) - Stream Restoration Training Evaluation Team
  - Examined different perspectives and developed a coherent view of training requirements
  - Conclusions:
    - Practitioners have degree but do not have restoration coursework
      - Short courses fill this gap
    - No consistent content or pattern to short course curricula
      - Introductory in nature, require no pre-requisites, does anyone ever fail?
    - Result - need for professional certification to test for a minimum level of qualifications across disciplines





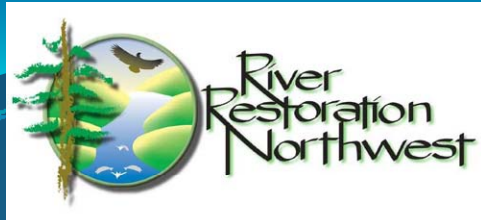
# Task Committee Efforts

- How are we achieving our goals?
  - Task #1 – Determine what is out there now
    - Compile information on existing restoration educational materials/courses
      - Institution or Organization
      - Course Title
      - Course Instructor
      - Course Objectives/Outcomes/Content
    - Summarize the current state-of-the-art in restoration education



Portland State University  
Graduate School of Education  
Continuing Education  
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Portland, OR 97207-0751  
Telephone: (503) 725-8279  
Toll Free: (800) 547-8887 ext. 8279





# Task Committee Efforts



- How are we doing it?
  - Task #2 – Determine what is needed by the profession
    - Survey of restoration professionals
      - Mid-Atlantic Stream Restoration Conference (November 2009)
      - River Restoration Northwest Annual Symposium (February 2010)
      - Upper Mid-West River Restoration Conference (February 2010)
      - Listserves, Email, Word of Mouth, etc.
    - Practitioner Survey
      - Demographic Information
      - Professional Certification
      - River Restoration Body of Knowledge

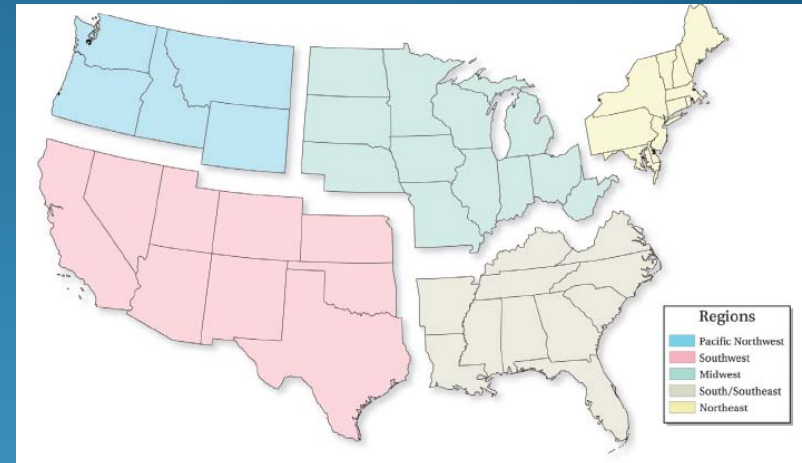
PRRSUM

PARTNERSHIP FOR RIVER RESTORATION AND SCIENCE IN THE UPPER MIDWEST



# Practitioner Survey

- Demographic Information
  - Discipline
  - Level of Experience
  - Professional Responsibilities
  - Region
  - Training Background
- Professional Certification
  - NCED Team– 2006 White Paper
    - Is this warranted?
    - Is this feasible?





**Report on 2003 Survey of  
River Restoration  
Professionals**

*Self-reported information on educational background of  
professionals in 10 discipline categories, as well as opinions  
on proficiency requirements and training needs*

# Practitioner Survey

- River Restoration Body of Knowledge
  - 2003 River Restoration Education Survey (RRNW)
  - 2003 American Fisheries Society Curriculum Working Group
  - 2006 NCED Working Group
  - 2009 Focus Group – identified a core of topics in:
    - Physical Processes (Fundamentals)
    - Ecological and Biological Processes (Fundamentals)
    - Stream Restoration Assessment and Monitoring
    - Restoration Design
    - Restoration Project Management
  - Do you agree with these topics?
  - Appropriate outcome for each topic?
  - Appropriate instructor for each topic?
  - Appropriate format for topic course?



# Active Learning

- Take a few minutes right now to fill out the Demographic Information Section of your survey



SLEEPING

Now is not the time

# Preliminary Results

- MASRC Participants
  - 36 out of 250 (14%) 
- Demographic Information
  - Expertise
    - Most Engineering, FG, and Env. Sci.
  - Experience Level
    - most > 4 years
  - Sector
    - private consulting and government
  - Areas
    - Design, Monitoring/Assessment, Project Management
  - Education – combination of college and short courses (25)
    - Core education in a related discipline – supplemented with short courses



## A Genuine College Degree in 2 weeks!

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**You'll thank me later...**

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*Man, I wasted 10 years of my life in college!*

# Body of Knowledge

- Courses - Focus Group
  - Practitioners, Academics, Government in all disciplines

**Suggested Courses for a Stream Restoration Body of Knowledge**

<b>Physical Processes Fundamentals Courses</b>	<b>Ecological and Biological Fundamental Courses</b>	<b>Stream Restoration Assessment and Monitoring Courses</b>
Watershed Processes/Hydrology	Stream Ecology	Surveying
Open Channel Flow	Habitat Structure and Function	Watershed Analysis
Geomorphology	Fish and Wildlife Biology	Geomorphic/Habitat Assessment
Sediment Transport	Botany/Riparian Dynamics	Biomonitoring/Bioassessment
<b>Restoration Design Courses</b>	<b>Restoration Project Management Courses</b>	
Design Approaches/Fundamentals	Project Development	
Alternatives Analysis	Risk and Uncertainty	
Analytical Techniques	Communication	
Ecohydraulics	Construction Management	



# Active Learning

- Take a few minutes right now to fill out the Body of Knowledge (Quest 1-6) section of the survey

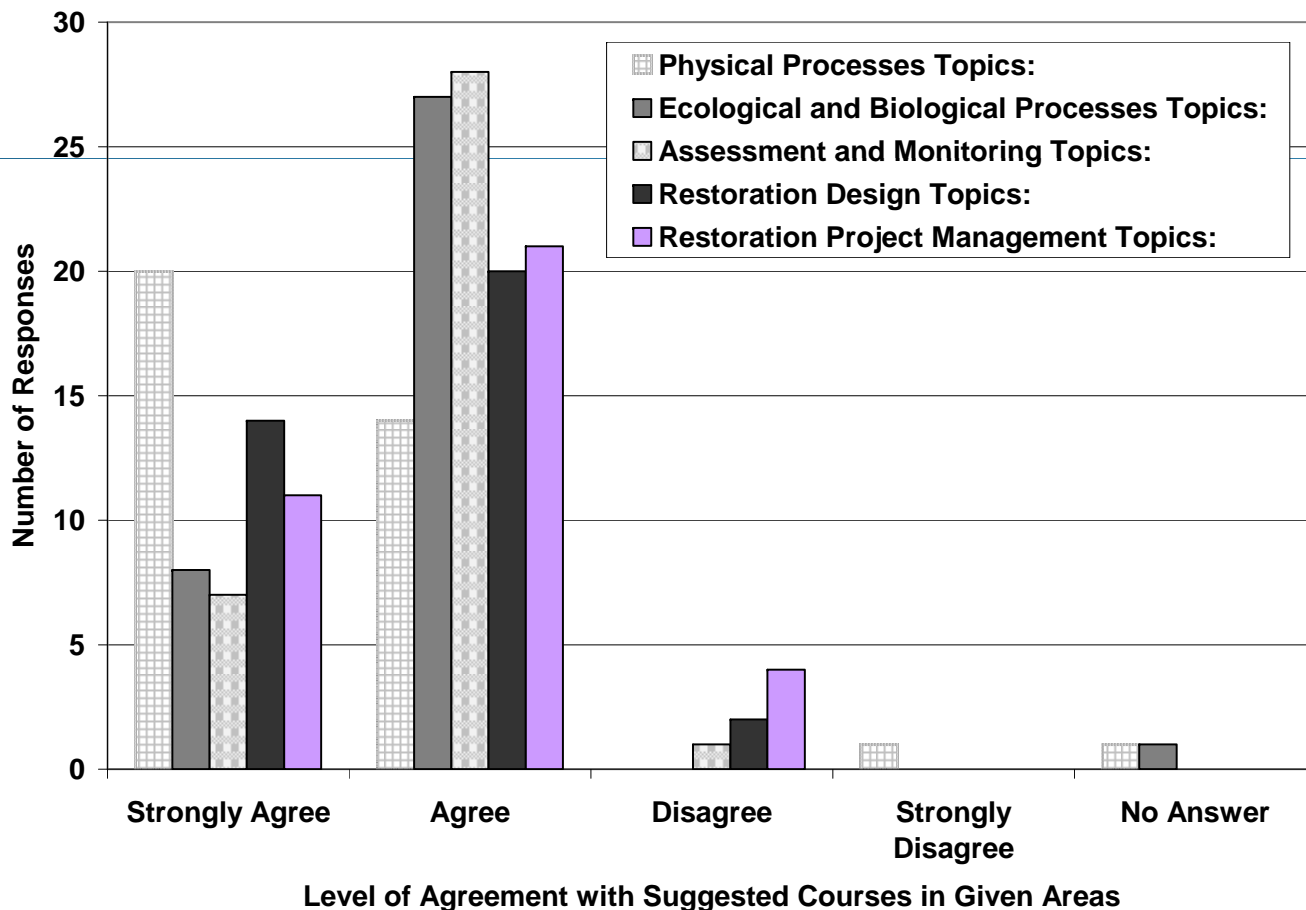


Mrs. McWit, reshelving Reader's Digest Condensed Books, slips a disk, proving again that a little knowledge is a dangerous thing.

© T. McCracken mchumor.com

# Preliminary Results

- Rank level of agreement with these topics/courses



1) Majority Strongly Agree with Physical Processes

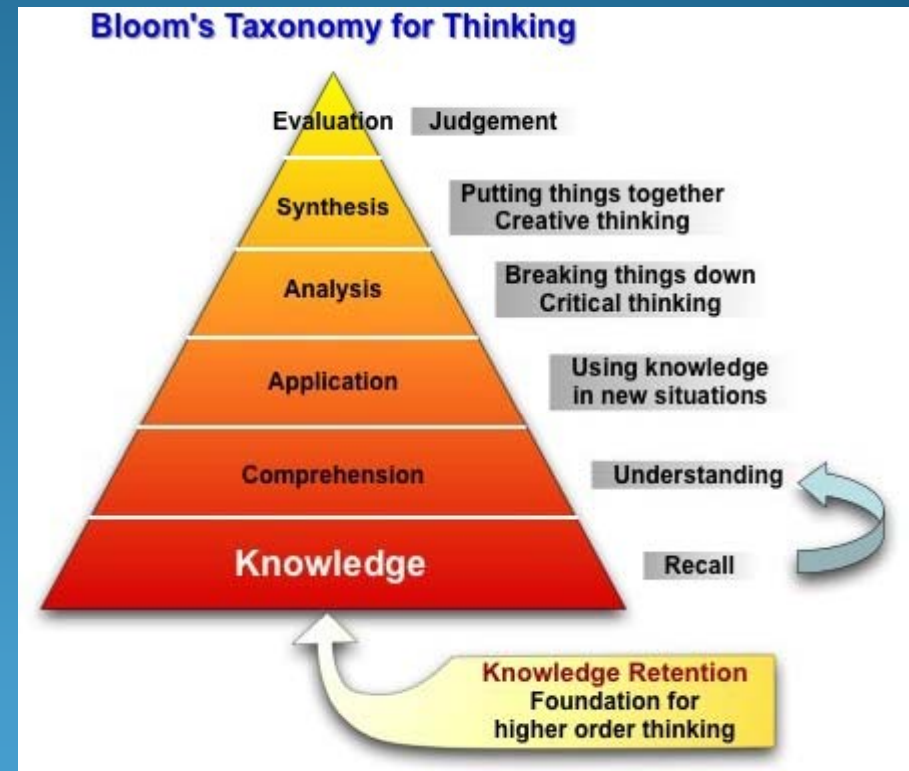
2) All Agree with Physical and Ecological Processes Topics

3) Close behind is Restoration Design

4) Additional Courses: GIS, soils, adaptive management, water quality, ethics

# Outcomes

- Body of Knowledge – Outcomes
  - Minimum level of learning – Bloom's Taxonomy
    1. Define key aspects of topic.
    2. Explain key concepts and problem solving processes.
    3. Apply knowledge and Solve simple problems.
    4. Analyze complex systems or processes.
    5. Design a complex system or Create new knowledge.
    6. Evaluate the design of a complex system or process.



# Active Learning

- Take some time to fill out the Body of Knowledge Outcomes (Quest 7) section of the survey



List the 7 Rosgen Stream Types?



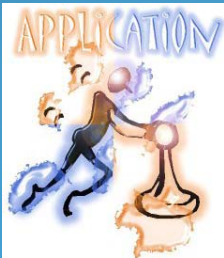
Compare energy expenditure in an A and C stream channel.



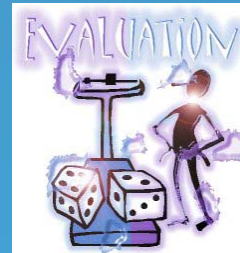
Explain the difference between an B and C Steam Type.



Design a C stream type.



In the Emriver stream table, construct a C stream type channel.



Judge the effectiveness of using a C stream type as the basis for your design.



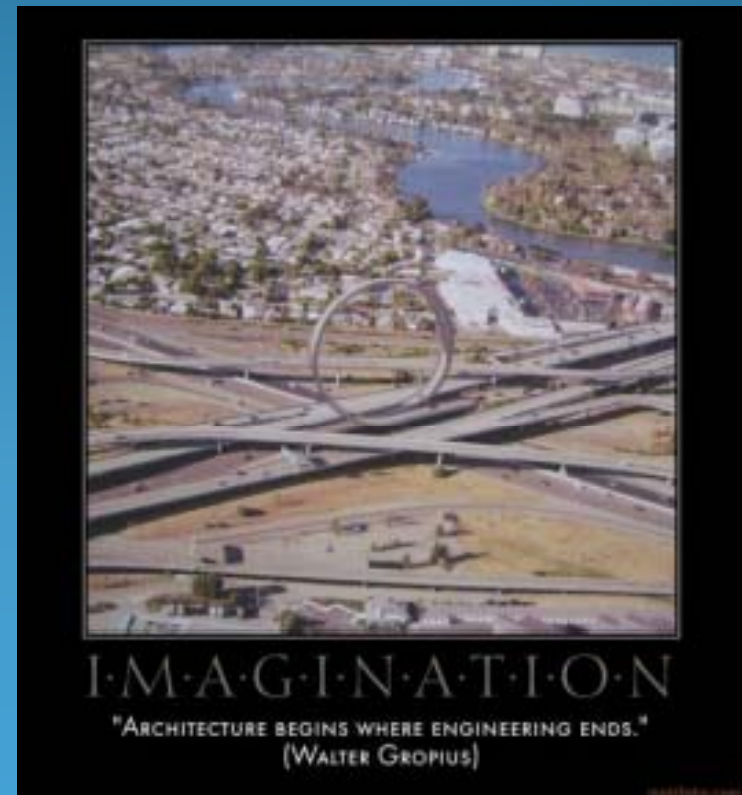
# Preliminary Results

- Body of Knowledge – Outcomes
  - Average level of learning
    - *Application and Problem Solving*
  - Design Approaches
    - *Analysis*
  - Seasoned Experts
    - *Analysis in most*
    - *Phys. Proc. and Restoration Design*

Suggested Course	All Respondents	Seasoned Expert (8+ years)	Novice/Recent Expert (<8 yrs)
<b>Physical Processes (Fundamentals)</b>			
Watershed Processes/Hydrology	3.55	3.71	3.42
Open Channel Flow	3.52	3.86	3.26
Geomorphology	3.88	4.07	3.74
Sediment Transport	3.73	3.93	3.58
<b>Ecological and Biological Processes</b>			
Stream Ecology	3.15	3.14	3.15
Habitat Structure and Function	3.50	3.29	3.65
Fish and Wildlife Biology	2.76	2.79	2.75
Botany/Riparian Dynamics	2.82	2.79	2.85
<b>Monitoring and Assessment</b>			
Surveying	3.18	3.29	3.11
Watershed Analysis	3.82	3.93	3.74
Geomorphic/Habitat Assessment	3.61	3.79	3.47
Biomonitoring/Bioassessment	3.03	3.36	2.79
<b>Restoration Design</b>			
Design Approaches/Fundamentals	4.25	4.62	4.00
Alternatives Analysis	3.88	4.14	3.68
Analytical Techniques	3.88	4.07	3.74
Ecohydraulics	3.07	3.55	2.78
<b>Restoration Project Management</b>			
Project Development	3.64	3.50	3.74
Risk and Uncertainty	3.41	3.43	3.40
Communication	3.36	3.29	3.42
Construction Management	3.55	3.57	3.53
<b>Average</b>	<b>3.48</b>	<b>3.60</b>	<b>3.39</b>

# Active Learning

- Take a few minutes to fill out the Body of Knowledge Instructor (Quest 8) section of the survey



# Preliminary Results

- Body of Knowledge – Suggested Instructors
  - (1) University Faculty
  - (2) Researcher
  - (3) Professional Practitioner
  - (4) Government Regulator/Reviewer
- Results:
  - Physical and Ecological Processes – University Faculty
  - Design, M&A, and Proj. Management - Practitioners





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Eric Petersen / The Livingston Enterprise

# Active Learning

- Take a few minutes to fill out the Professional Certification section of the survey

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search ID: shu0066

"Excuse me, Sir — I wonder if you'd mind helping me with a survey.....?"



## COURAGE

Do one brave thing today... then run like hell.

# Preliminary Results

- Level of Agreement with:

*“The stream restoration profession would benefit from the establishment of a National River/Stream Restoration Certification Program (similar to that developed by the American Society of Floodplain Managers or the Association of State Wetland Managers). This certification would establish a minimum level of qualifications across disciplines for practicing stream restoration professionals. Certification would recognize continuing education and professional development that enhances the knowledge and performance of stream restoration professionals.”*

- 29 of 36 Strongly Agreed and Agreed
  - Indicating some type of certification is warranted

# Preliminary Results

- Level of Agreement with:

*“States or Regions should develop their own professional certification in stream restoration (in addition to an established National Certification) to account for local and regional requirements or conditions.”*

- More neutral response to this statement
  - 14 Agreed
  - 11 Disagreed
  - 7 strongly disagreed



# Preliminary Results

- Requirements for Certification:
  - (1) *completion of a series of courses*
  - (2) *continuing education credits*
  - (3) *passing a national exam*
  - (4) *portfolio of projects completed under a mentor*
  - (5) *professional experience*
  - (6) *professional recommendations/endorsements.*
- Best Requirements – (4) portfolio and (5) professional experience in field
- Worst Requirement – (3) passing a national exam

# Summary of Results

- Educational background and areas of expertise
  - multi-disciplinary and diverse
  - core classes in college, supplemented with short courses
- Restoration curriculum – multi-disciplinary with courses in
  - Physical Processes
  - Ecological and Biological Processes
  - Monitoring and Assessment
  - Restoration Design
  - Restoration Project Management
- Average Level of Learning in Courses = Application
- University faculty - fundamentals, practitioners - rest
- Professional certification warranted
  - Requirements - professional experience and portfolio of projects

# How do you participate?

- Hard copy of survey is being distributed
- Take some time to fill out the survey
- Deposit the completed survey in the drop box in the Break Room
  - By 4 pm on Tuesday, February 23, 2010
- Fax or scan and email the completed survey to:
  - Sue Niezgoda
  - Fax Number: (812-877-8440)
  - Email: [niezgoda@rose-hulman.edu](mailto:niezgoda@rose-hulman.edu)
- Fill out online version of survey before March 31, 2010
  - <http://dev.rose-hulman.edu/StreamRestoration/Feb2010b>



MASRC – 36 out of 250

RRNW – 80 out of 350

UMSRS - ??????





# BACK TO SCHOOL

Resistance is futile at Borg High

