

Panel Session Part 2: Integrated Restoration & Design Approaches - Regional Perspectives

- **Jason Vogel**, University of Oklahoma, Norman, OK



- **Aarin Teague**, PhD, PE, CFM, ENV SP, San Antonio River Authority, San Antonio, TX



- **AJ Jones**, PE, ESCM, Wolf Water Resources, Portland, OR



- **David Bidelspach**, 5 Smooths Stone Restoration, Livermore, CO



- **Greg Jennings**, PhD, PE, Jennings Environmental, Asheville





Integrated Restoration and Design Approaches – A Perspective from the Southern Great Plains

Jason R. Vogel, Ph.D., P.E.

Professor, Civil Engineering and Environmental Science

Director, Oklahoma Water Survey

University of Oklahoma



- **Southern Great Plains Regional Perspectives on Stream Restoration**

- Importance of understanding of the streams and soils in the area
- Early adopters are very important
- Sometimes the definition of success may change over time
- Hybrid approaches are becoming much more common
- Stabilization is often still the driving force

- **Integration and Connections between stormwater, floodplains, and stream restoration design**
 - **Low Impact Development for water quality *and* flood control**
 - Significant reductions of peak flow are possible, which impact downstream sediment carrying capacity
 - Location of BMP matters (upstream versus downstream)
 - **Changing flows from climate change and/or urbanization**
 - Changing bankfull flows
 - Increased frequency of larger flows
 - Increased frequency of low flow
 - **Water-quality improvements from instream processes resulting from appropriate structures and floodplain connection (discussed, but only as secondary benefit)**
 - **Oklahoma Floodplain Managers Association considering name change to include stormwater quality**

- **Connections between streams and wastewater effluent reuse under climate change scenarios**
 - **Climate Change**
 - **Wastewater Reuse**
 - **Impacts on water quantity, water quality, and habitat**
 - **Reservoir Management could play an important role in mitigating effects**
 - **Could these impacts affect vegetation and change stable form in streams?**



Thank You!!

OKLAHOMA WATER SURVEY



at The UNIVERSITY of OKLAHOMA

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Integrated
Restoration-
South Central
Texas

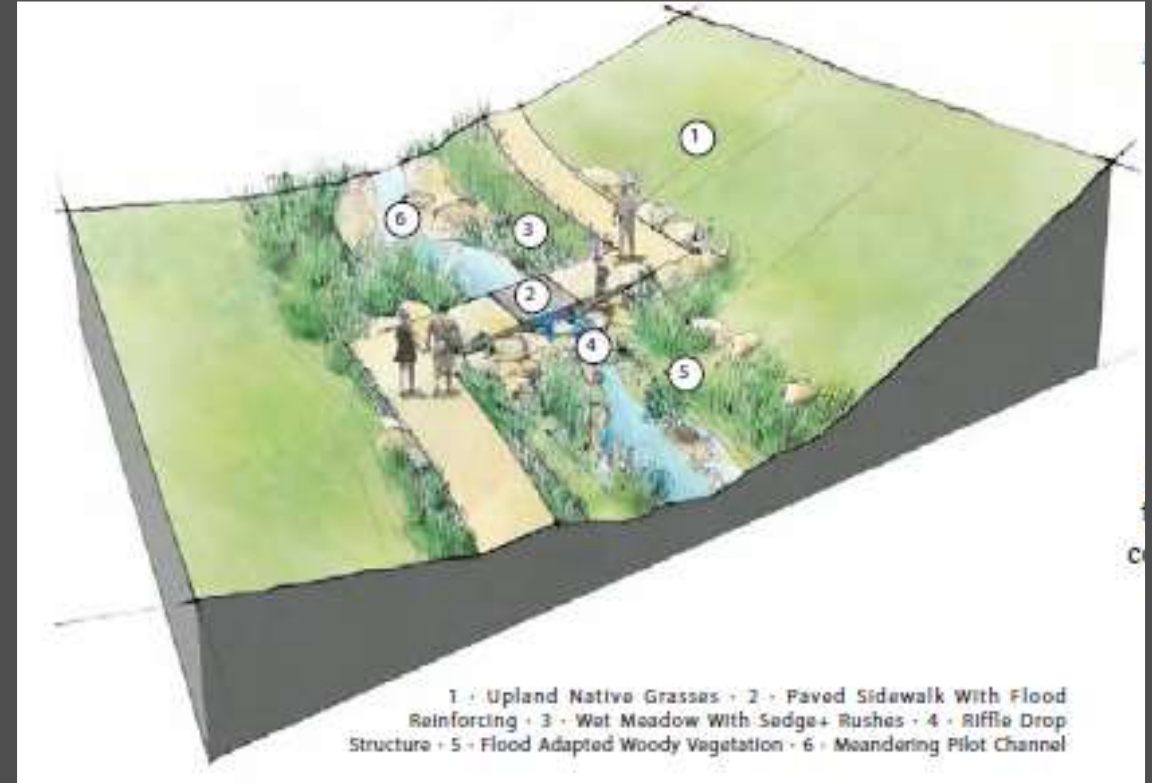
























Integrated Stream Restoration in the Pacific Northwest

National Stream Restoration Conference

August 21, 2023

AJ Jones, PE

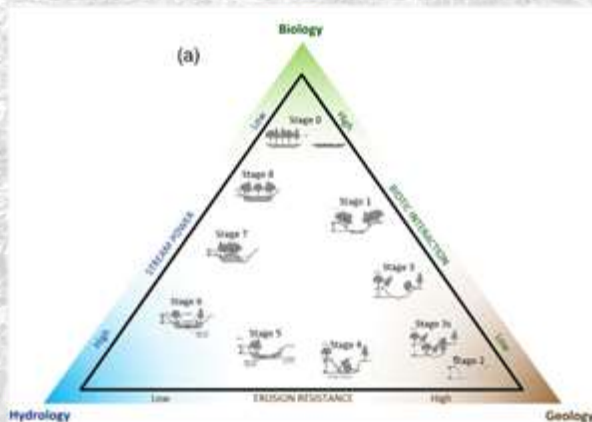
Wolf Water Resources

Portland, OR



Stream Restoration in the PNW – What's Happening?

- Restoring Floodplain Ecosystems - Stage 0/Stage 8
- Designing Resilient Stream Corridors
- Replacing Bridges & Culverts
- Questions and Discussion



Valley Wide Floodplain Ecosystem Restoration - Stage 0

Whychus Creek, Upper Deschutes Watershed Council



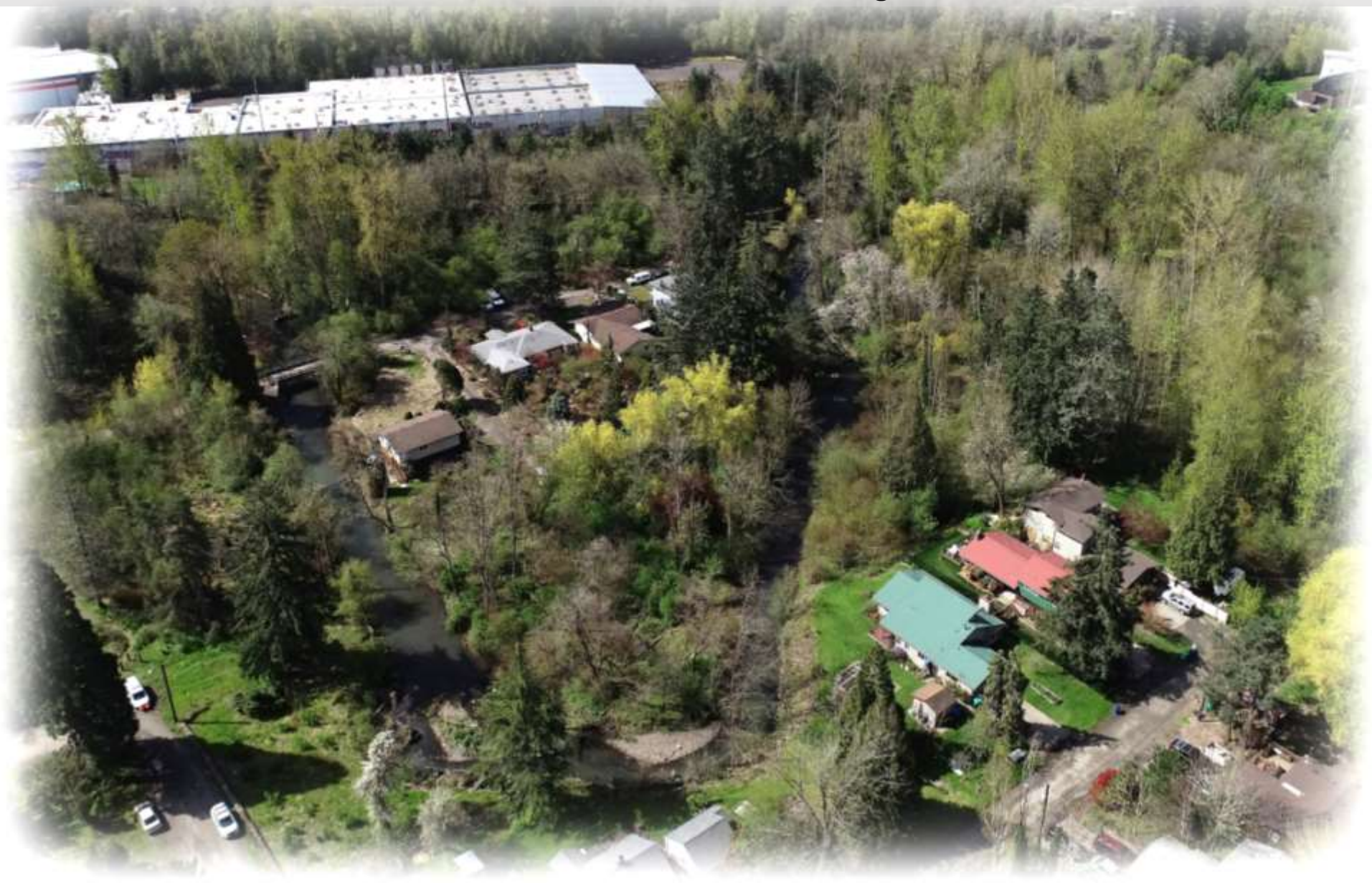
July 2014,
2-years prior to construction



August 2018,
2-years post construction

Reconnecting & Enhancing Urban Floodplains

Johnson Creek Portland, Oregon



Restoring Streams Using Process Based Approaches





Bridges & Culverts

Improving Fish Passage
& Integrating the Floodplain





Questions?

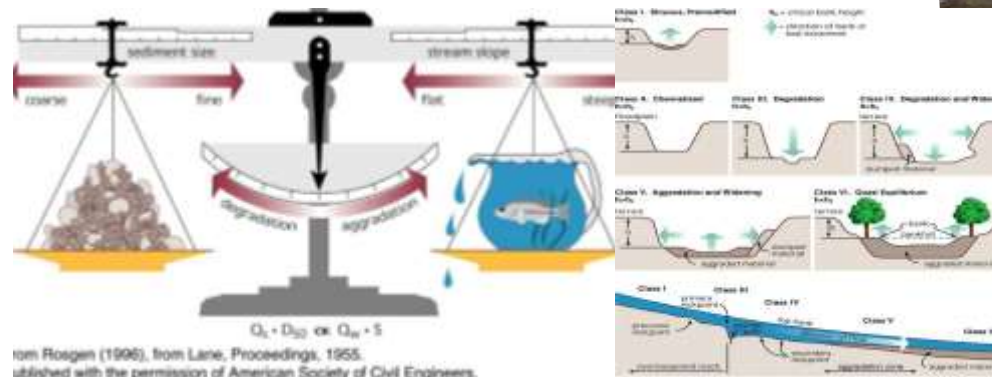
Intermountain West

Reorganizing a Toolbox for Western Ecosystem Restoration

Integrated Restoration & Design Approaches -
Regional Perspectives



David



Why are WE doing Stream Restoration in the Intermountain West? (n=35) (CO, WY, UT, NM, UT, ID)

- Sustainable Development
- [Biodiversity](#) and Habitat Improvements
- [Recreation](#) and [Fisheries](#) Improvements
- Aesthetics and Landscape Design
- [Water Reliability](#)
 - Irrigation
 - Water Rights
 - Water Yield
 - Streamflow
- Stream Bank Stabilization
- Mitigation
- Post Fire
- Flooding and Post Flood
- Dam Removal
- Improved Ecological Function
- Water Quality

Cumulative anthropogenic influences (200yrs)



What Tools are being used for Restoration?

- Bio-engineering
- Change of Point of Diversion
- Fisheries Improvements with structures
- Floodplain Corridor Shear Stress
- Floodplain Restoration Legacy Sediment Removal
- Four - Stage Urban Restoration – Low Maintenance High Functioning
- Low Tech Design
- Natural Channel Design (Rosgen 2007)
- Natural geomorphic Recovery
- Process-Based Design (Beechie 2010)
- Beaver Dam Analogs
- Stage Zero Design
- Stormwater Management and Masterplanning
- Threshold Channel Design



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- Stormwater Management and Masterplanning
- Threshold Channel Design
- *Bank Stabilization*
- *Reducing Sediment Supply*
- *Property Protection*
- *Fish habitat Improvements of pools Toe Wood and J-hook vanes (log and rock)*
- *Grade Control for Irrigation diversions*
- *The multi-stage channel (inner berm, bankfull, active floodplain and floodprone area) is a dominant method.*
- *Zedyke Zuni Bowls*
- *AutoCAD*
- *Survey Grade GPS*
- *Lidar*
- *Process-based Design*
- *Gravel Augmentation*
- *Braided and Stage Zero Channels*
- *Engineered Log Jams*
- *Reference Reach*
- *Hydraulic Models*
- *404 mitigation*
- *Emergency Watershed Protection*
- *ESA*
- *Natural Recovery*

Trends – In the Intermountain West

- Natural Areas → Biodiversity and Variability
- Agricultural Areas → Recreation and Stability
 - Gentleman Ranchers → Recreational Fisheries
 - Working Ranches/Irrigation → Stability and Reliability
- Urban planning → Stabilization Multi-stage Channel
 - Geomorphic Channel (Effective, Bankfull, Professional Judgement)
 - 70% of the 2-year
 - 10% of the 100-year
 - 4-Stage (Inner-berm, Bankfull, Flood Terrace, Regional Terrace)
 - Flood Protection



Comparison of Philosophy and Tools

A theory or attitude held by a person or organization that acts as a guiding principle for behavior:

Philosophy

(Humans think Truth is found through)

- Nihilism – Nothing
- Existentialism – Anti-Hope
- Stoicism – Acceptance
- Hedonism – Pleasure
- Marxism – Anti-Capitalist
- Positivism – Logic
- Taoism – Humility
- Rationalism – Reason
- Relativism – Perspective
- Buddhism – Suffering

Tools

(Humans use to carry out a particular function)

- Natural Channel Design
- Process Based Design
- Stage Zero Restoration
- Large Woody Debris
- Hay Bale Grade Control Structures
- Fly Links Ecosystem Sport
- AutoCAD 3-D design
- Beaver Dam Analogs
- Ground Based Lidar
- Functional Assessment
- Stream Quantification Tool
- Survey Grade GPS
- Innovative In-channel Structures

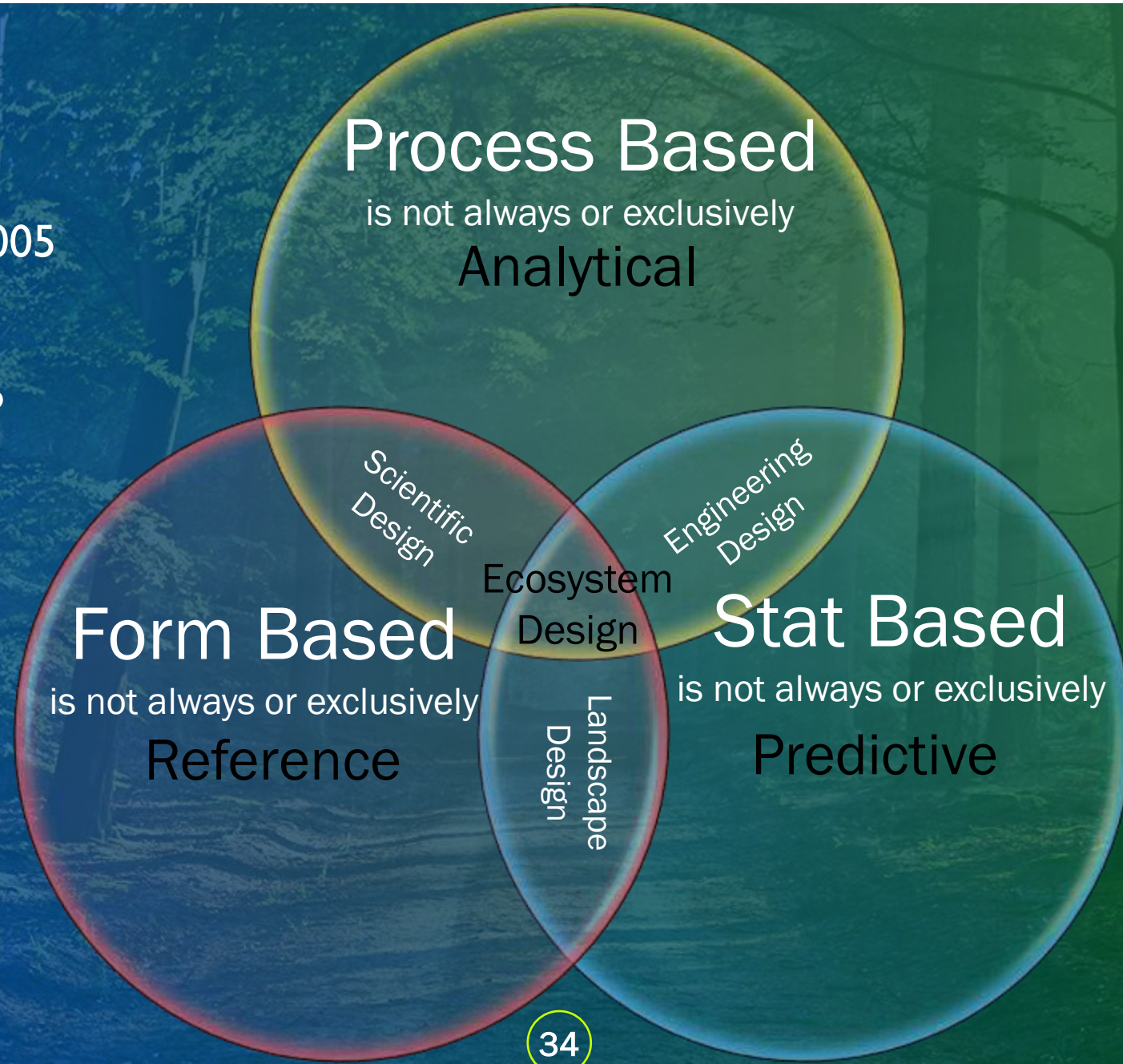
3 Design Toolbox – “Philosophies” – Ecosystem Restoration (Many Tools)

- Analytical Based Design
 - Understanding of **Scientific** Equations and Laws of the **Natural World**
- Reference Based Design
 - **Scientific** observation of the **Natural World**
- Predictive Based Design
 - **Scientific** prediction of interactions in the **Natural World**



(Many Tools)
Process vs. Form

Montgomery, 1999
Bernhardt, et al, 2005
Kondolf, et al, 2006
Beechie, 2010
Kasprak, et al, 2016

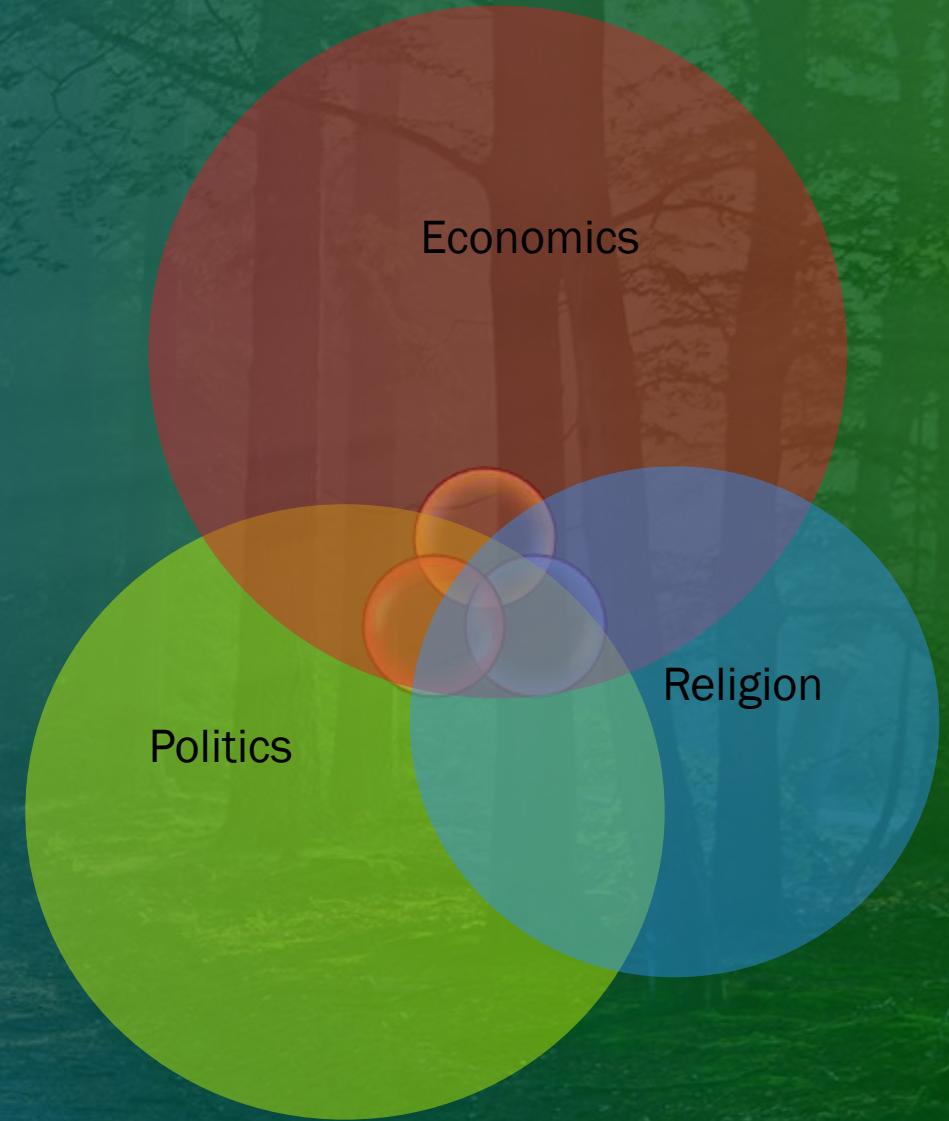


(Many Tools)

Parallel Universes (Scientific American, 2022)

Statement

- Designing with Goals and Objectives in Mind
- Sharing Experiences Promotes Excellence





THANK YOU!



David Bidelspach

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*Pleasant Grove Floodplain:
70 acres of restoration on a former golf course*

Ecosystem Solutions:

***Achieving multiple objectives using
integrated design approaches***

Greg Jennings, PhD, PE
Jennings Environmental PLLC
greg@jenningsenv.com



Jennings
Environmental

Pleasant Grove Floodplain



- *Stream & wetland creation and enhancement*
- *River berm removal for floodplain connection*
- *Backwater slough creation for fish habitat*

Objectives:

- Ecological
- Recreation
- Flood Resilience

Design Approaches:

- Floodplain Functions
- Natural Channel
- Vegetation

Pleasant Grove Floodplain



Objectives:

- Ecological
- Recreation
- Flood Resilience

Design Approaches:

- Floodplain Functions
- Natural Channel
- Vegetation

Muskellunge
Esox masquinongy

- *Stream & wetland creation and enhancement*
- *River berm removal for floodplain connection*
- *Backwater slough creation for fish habitat*

Mud Creek Floodplain



- *Braided channel creation for stormwater*
- *River berm removal for floodplain connection*
- *Backwater slough creation for fish habitat*

Objectives:

- Ecological
- Recreation
- Flood Resilience

Design Approaches:

- Floodplain Functions
- Vegetation



Mills River Floodplain Connection



- *Berm removal for floodplain connection*
- *Riparian buffer creation*



Objectives:

- Ecological
- Flood Resilience

Design Approaches:

- Floodplain Functions
- Vegetation

Foster Creek Restoration



- *Channel realignment and floodplain connection*
- *In-stream structures*
- *Riparian buffer creation*

Objectives:

- Ecological
- Flood Resilience
- Infrastructure Protection

Design Approaches:

- Natural Channel
- Floodplain Functions
- Vegetation

Grassy Creek Restoration



- *Channel realignment and floodplain connection*
- *In-stream structures*
- *Riparian buffer creation*

Objectives:

- Ecological
- Recreation
- Infrastructure Protection

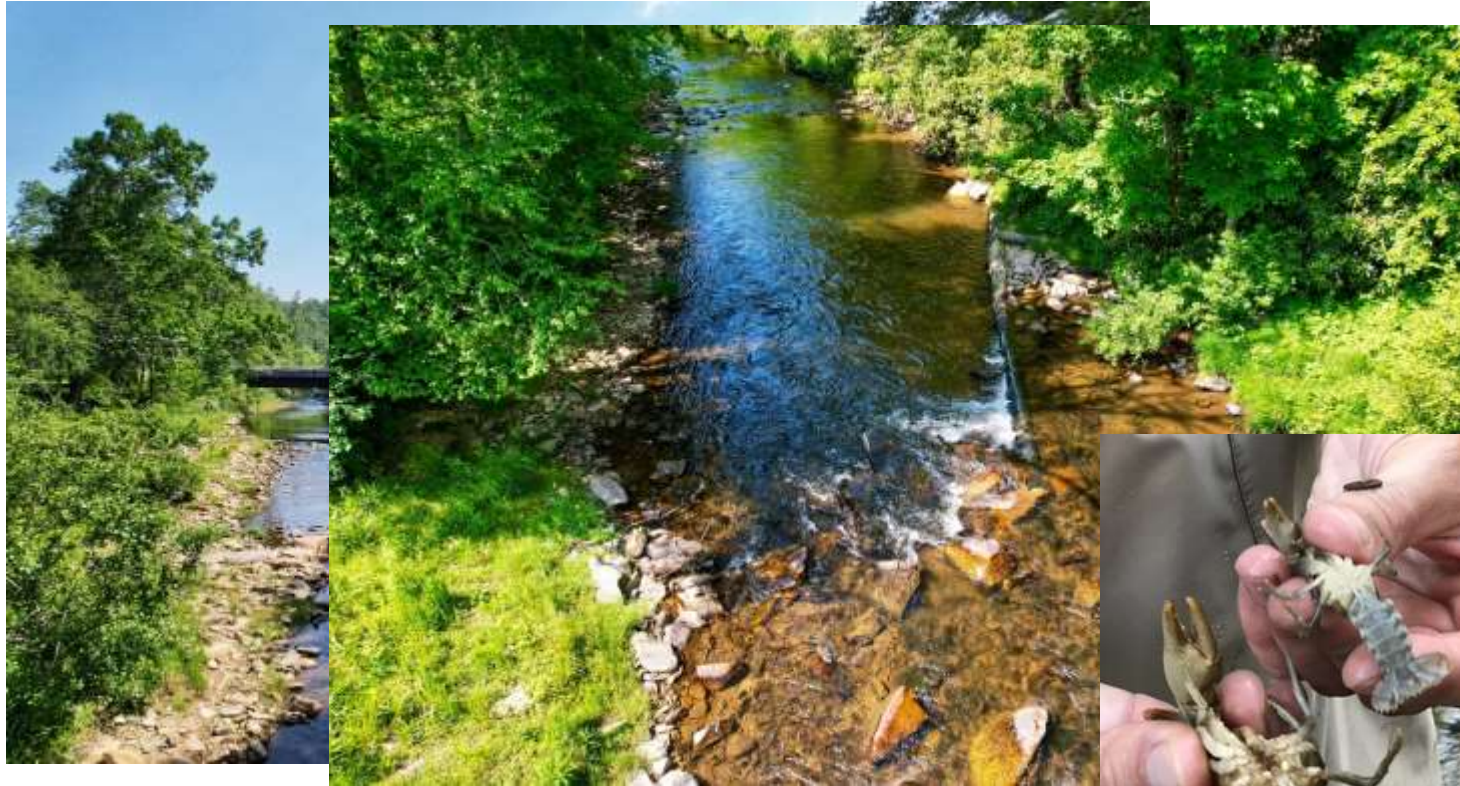
Design Approaches:

- Natural Channel
- Floodplain Functions
- Vegetation

Eastern Hellbender

Cryptobranchus alleganiensis

Linville River Restoration



- *Channel realignment and floodplain connection*
- *In-stream structures*
- *Riparian buffer creation*



Objectives:

- Ecological
- Recreation
- Infrastructure Protection

Design Approaches:

- Natural Channel
- Floodplain Functions
- Vegetation

Grandfather Mountain crayfish
Cambarus eeseohensis

River Bank Stabilization



- *Wood and rock toe revetments*
- *In-stream structures*
- *Riparian buffer creation*



Objectives:

- Infrastructure Protection
- Ecological / Recreation

Design Approaches:

- Stabilization
- Vegetation



Purlear Creek: 13 years after restoration

Ecosystem Solutions:

- *Design to achieve objectives*
- *Manage risk*
- *3 Fs: Floodplain, Flora, Fauna*

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Jennings
Environmental