Restoration Ecology

A Bank of Tangled Definitions

Chuck Rhoades

Rocky Mountain Res. Sta.

Ft. Collins, Colorado

Healthy Forest Restoration Act

Provisions to expedite hazardous-*Fuel Reduction and Forest-Restoration Projects* on specific types of Federal land that are at risk of wildland fire or insect and disease epidemics.

Prevent catastrophic wildfires by promoting forest management;

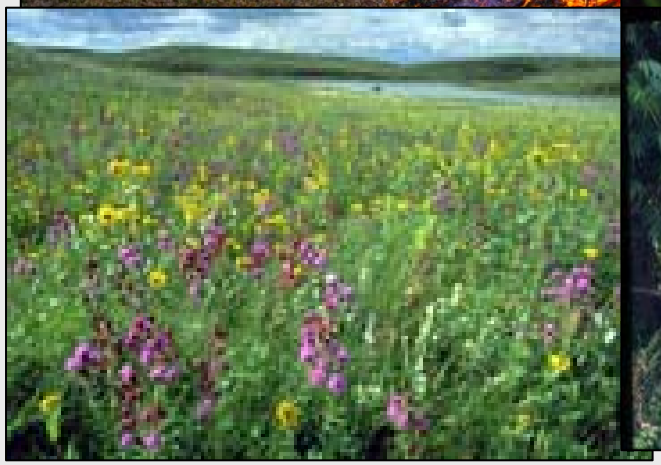
Ensure sustainable forest management and appropriate timber production.

Address *Forest Health Crisis* using forest thinning and restoration projects

HRFA of 2003; (P.L. 108-148)
(from www.whitehouse.gov)

What is Ecological Restoration?

"Forest Restoration = Fuels Reduction"

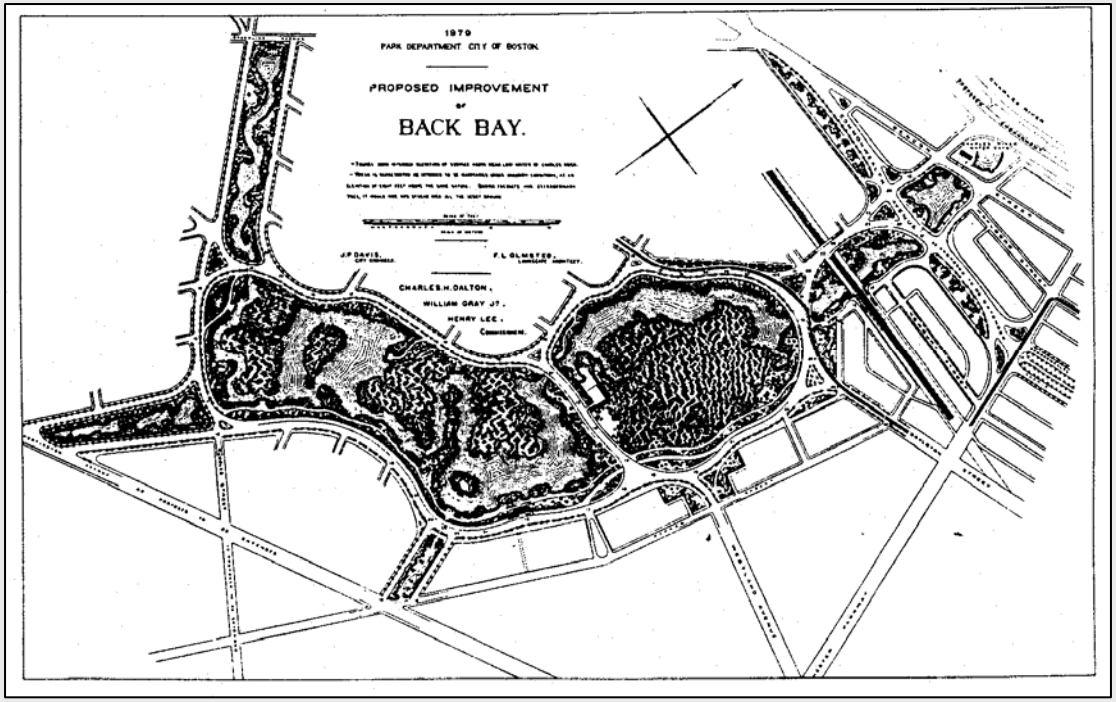


Objectives

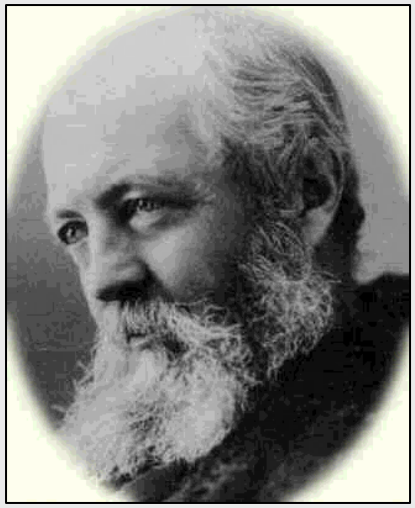
- Historical Context
- Definitions
- Considerations

Early Restoration

Fredrick Law Olmstead
(1822-1903)



Back Bay, Boston



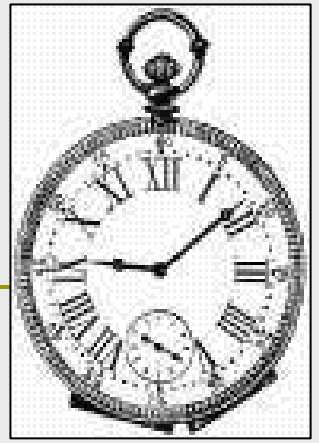
Joined -

Civil Engineering
Wetland Ecology
Landscape Aesthetics

Dust Bowl
Restoration Precedents

The time has come for *science to busy itself* with the earth itself. The first step is to reconstruct a sample of what we had to begin with (A. Leopold 1934).

Aldo Leopold 1953



Restoration & Land Ethics

To keep every cog and wheel
is the first precaution of *Intelligent Tinkering.*

If the land mechanism as a whole is good,
then every part is good,
whether we understand it or not.

Only those who know the most about it can appreciate how little we know about it. The last word in ignorance is the man who says of an animal or plant: "What good is it?"

Ecological Restoration is:

A *Process of Assisting the Recovery* of an ecosystem that has been degraded, damaged or destroyed (SERI 2004)

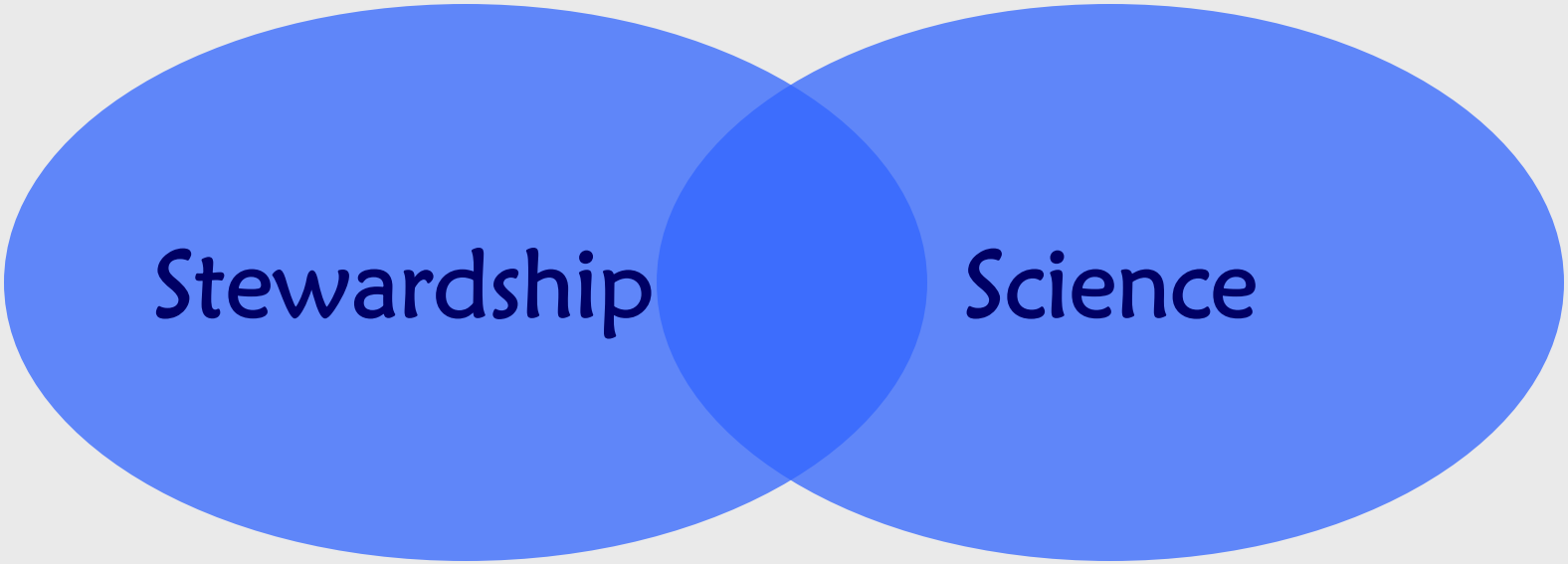
An *Intentional Activity* that initiates or accelerates the recovery of an ecosystem with respect to its health, integrity and sustainability (SER 2004).

The *Study of Recuperating* degraded, damaged or destroyed ecosystems through active human intervention (Wikipedia)

The *Return of an Ecosystem* to a close approximation of its condition prior to disturbance (NRC 1992)

Ecological Restoration is:

- An Intentional Activity
- The Study of Recuperating Damaged Ecosystems



Restoration Stewardship

" a new orientation toward nature"

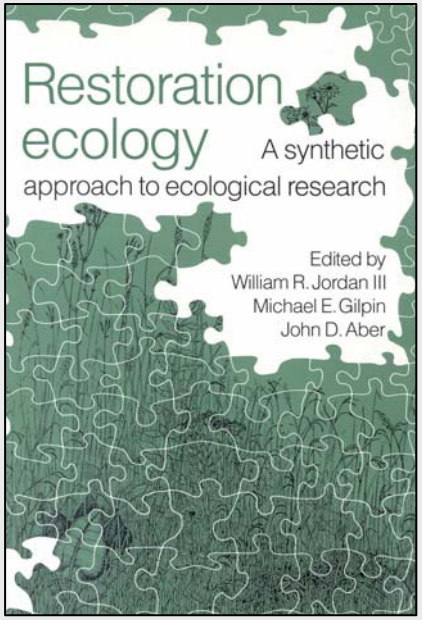
While *Exploitation* and *Preservation* will continue in areas that remain *Productive* or *Pristine*,

… a third approach, *Restoration*, may become a viable option with important *Implications for both Management and Preservation.*

A tool for the re-creation and maintenance of biotic diversity and quality on a shrinking planet.

It may alter the prevailing view of human activity as necessarily having a negative impact on the landscape.

1985 Jordan, Gilpen & Aber



Restoration Stewardship

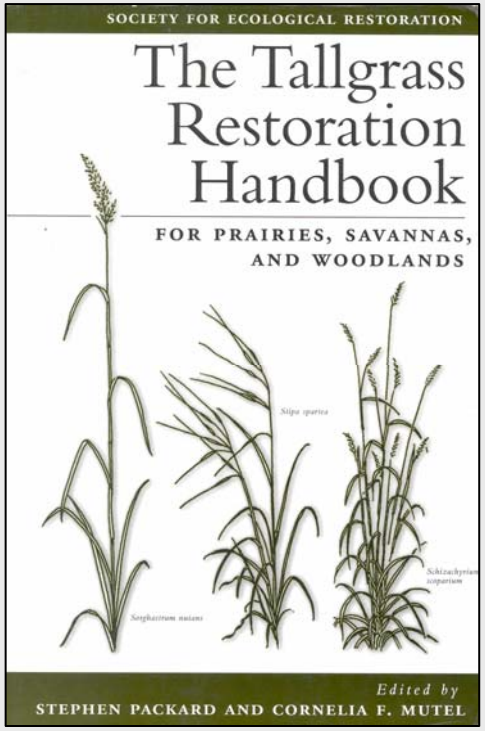
A *Conservation Strategy* that expands Earth's biological diversity

Repair or *Reestablishment* of a natural community by reinstating as many as possible of the *Species* and *Processes* that evolved together in response to the physical environment and to one another over thousands of years of more.

Proving ground for the development of a highly practical expression of [Leopold's own] land ethic.

Clear sign that it is possible both *Technically* and *Socially* to reverse environmental destruction.

1997 Steve Packard



Restoration Science

….the science of land health Aldo Leopold 1953

The acid test of our understanding is not whether we can take ecosystems to bits on pieces of paper, however scientifically, but whether we can put them together in practice and make them work. A.D. Bradshaw 1983

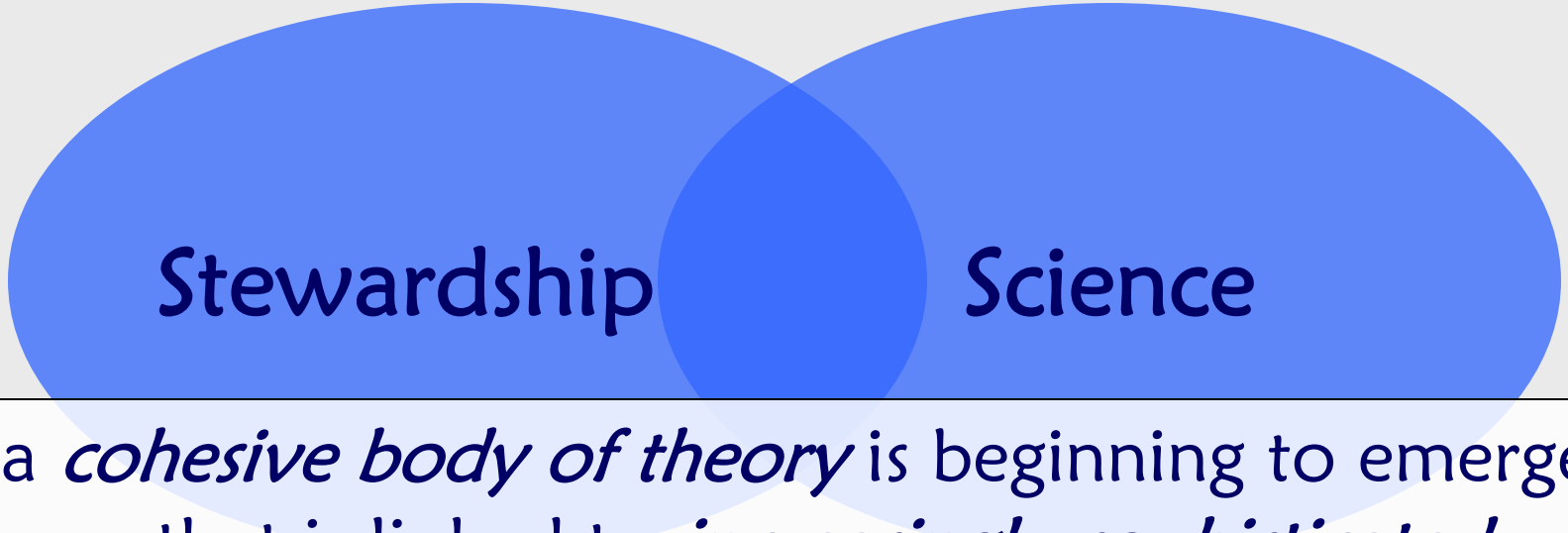
Help raise and answer ecological questions synthetically, by reconstruction, rather than by description and dissection.

A technique for basic research, leading in turn – as does basic research in medicine – to improved restoration techniques.

J. Aber & W. Jordan 1985

Ecological Restoration is:

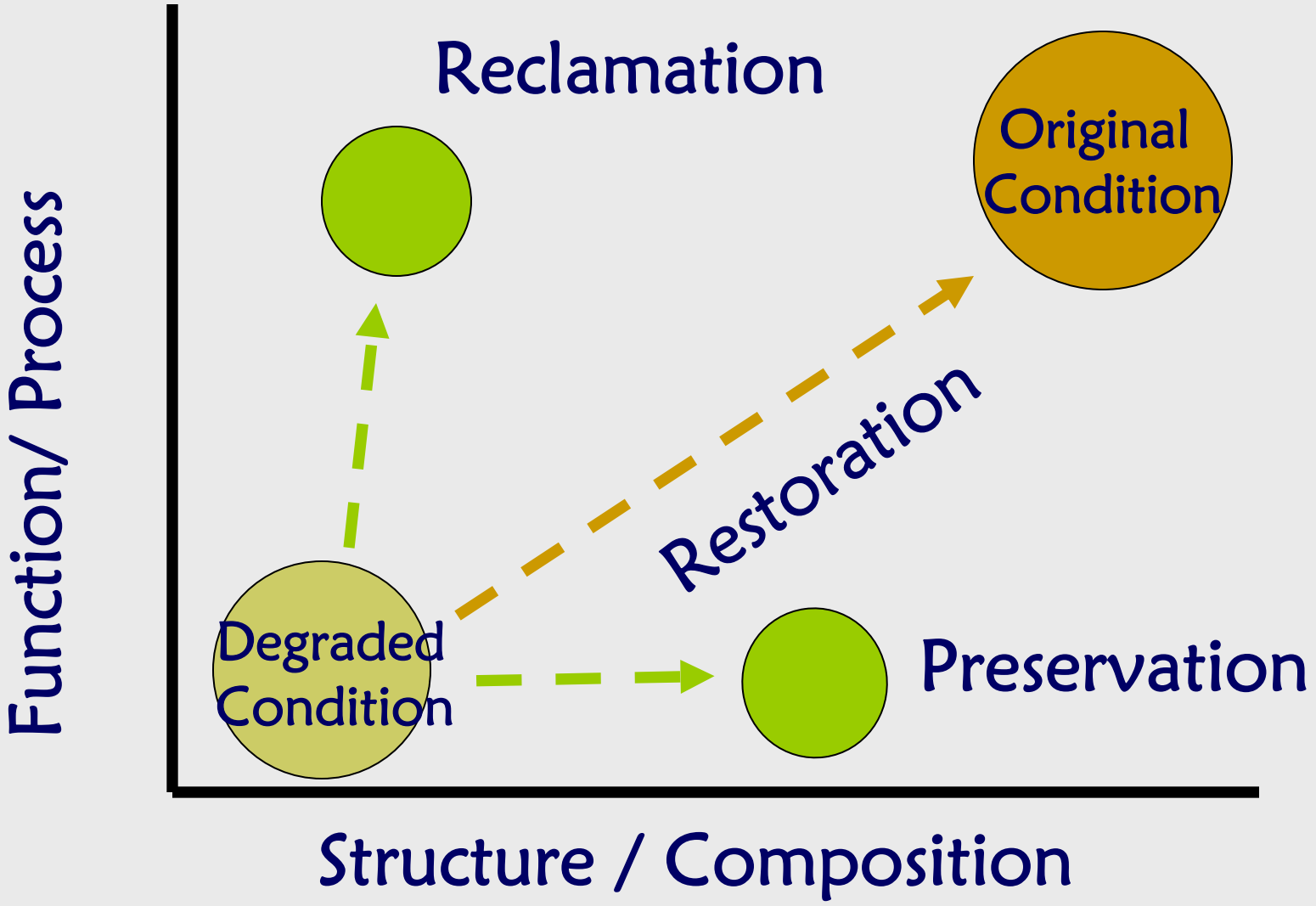
An Intentional Activity
The Study of Recuperating Damaged Ecosystems



"a *cohesive body of theory* is beginning to emerge that is linked to *increasingly sophisticated restoration practices*"

J. Harris, R. Hobbs, E. Higgs, and J. Aronson. Restoration Ecology 2006

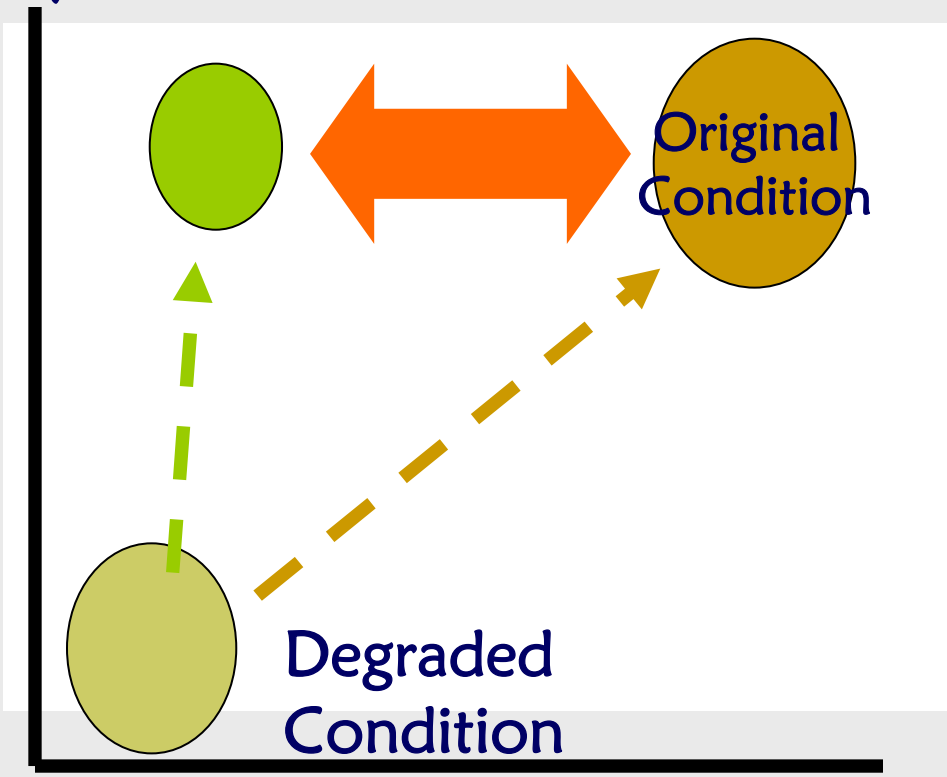
Restoration Considers
both Form & Function



What Makes Restoration Different ?

Restoration uses techniques of reestablishing the composition, structure, and disturbance regime of a *Historical or Indigenous Reference Ecosystem* to help recover the ecological integrity of a site.

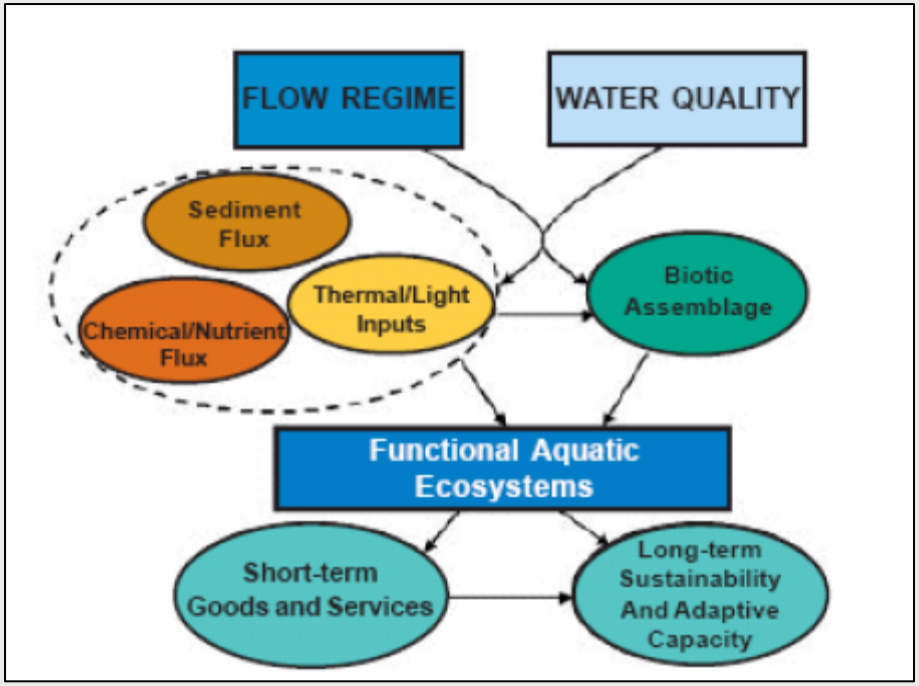
Conservationists and Restorationists may use similar approaches, but Restorationists often use *Reference Conditions to develop project objectives.*



Wagner et al. 2000 JOF

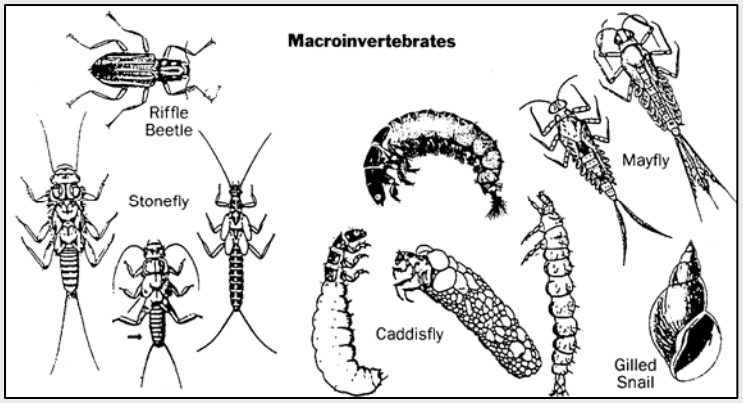
Restoration Considers …

– Riparian Function



Restoration Considers …

Form & Function - Bioindicators



Biodiversity Protection
Restoration Success
Natural Variability

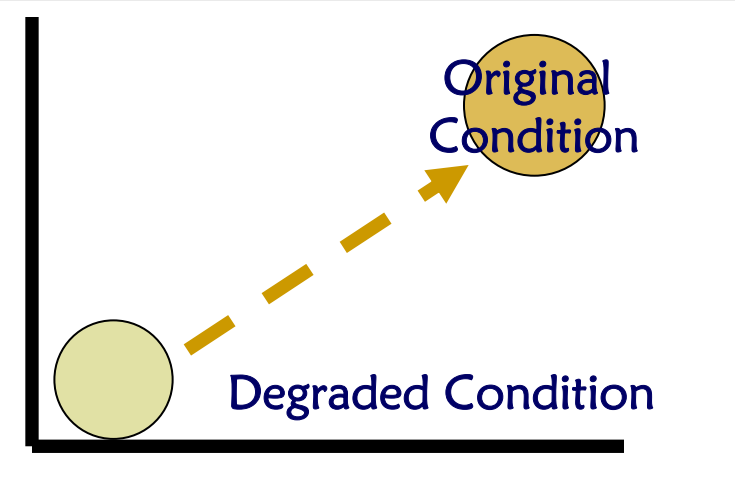
Other Justifications for Restoration Practices

Restore Highly Degraded local sites

Improve the Productivity of degraded Productive lands

Enhance conservation value of
Protected and Productive Landscapes

What Reference Condition?



Original Vegetation

Community Now Best Expressed by the flora & fauna

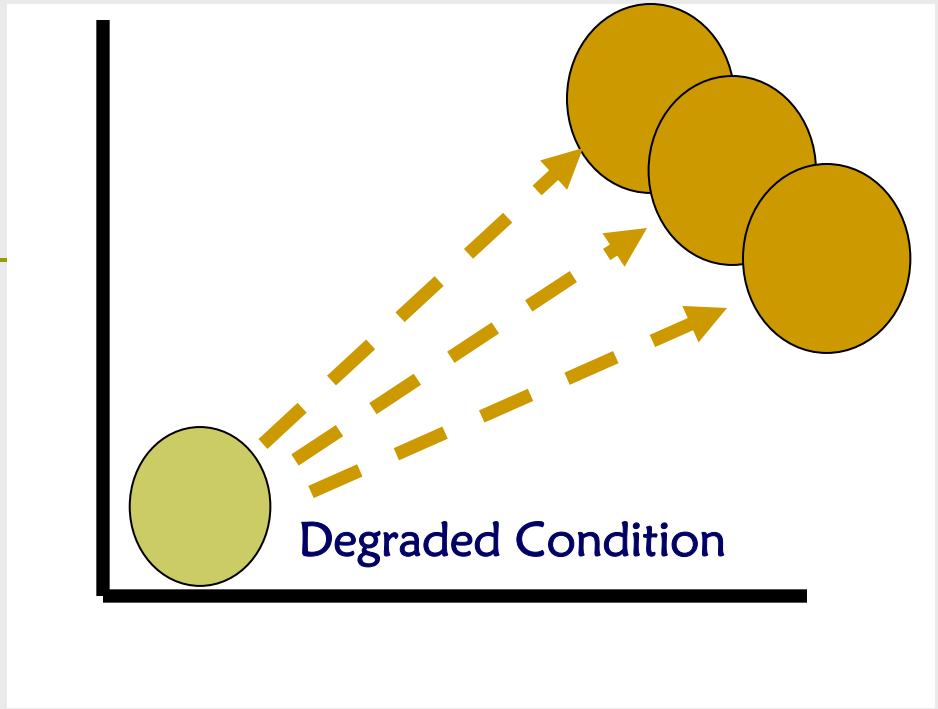
Rarest or the otherwise highest priority community

Representative Variety of communities

Largest Possible Example of a given community

Most Easily Attainable Mix of communities

What Reference Condition?



Adaptive Management Approach

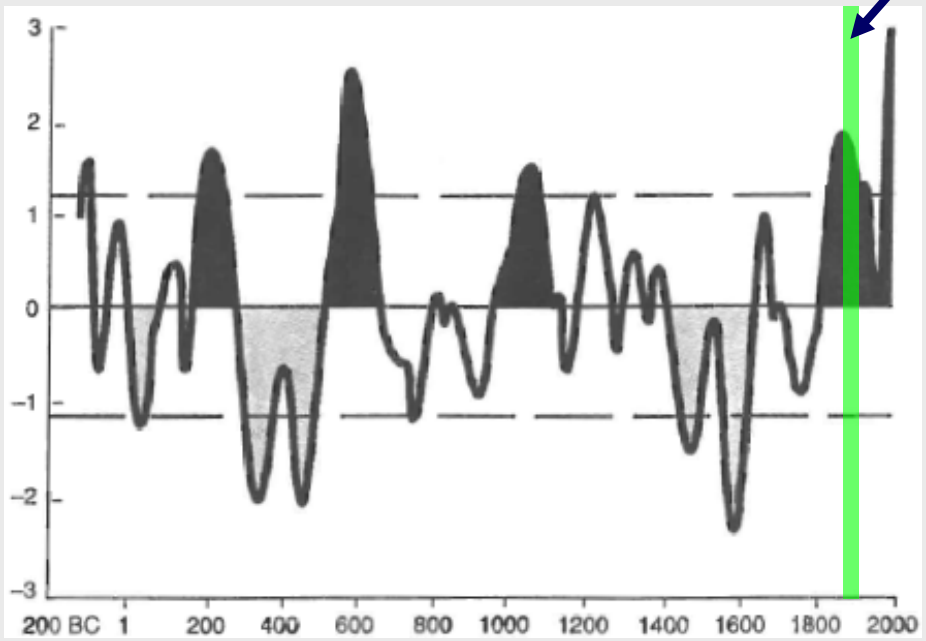
1) Initial characterization of the reference condition becomes a *Model for Restoration*

2) Insights gained from Restoration activity *Refine the Reference Conditions*

Selecting a Reference Condition

Pre-Settlement Period

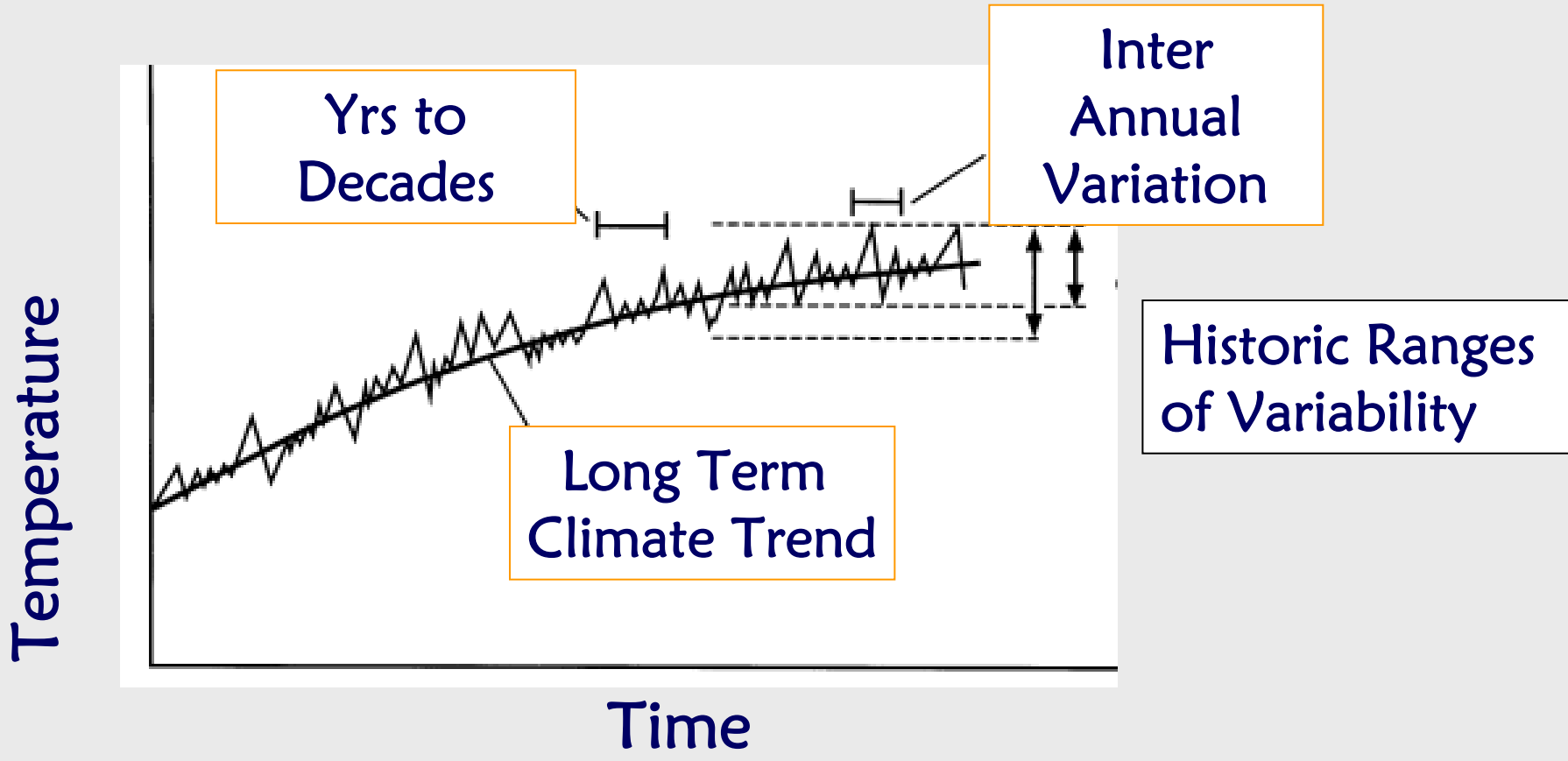
Precipitation



If we wish to restore an ecosystem to its state *"Prior to Degradation"*, when do we choose?

Selecting Reference Conditions

Multiple Temporal Scales



Restoration & Climate Change

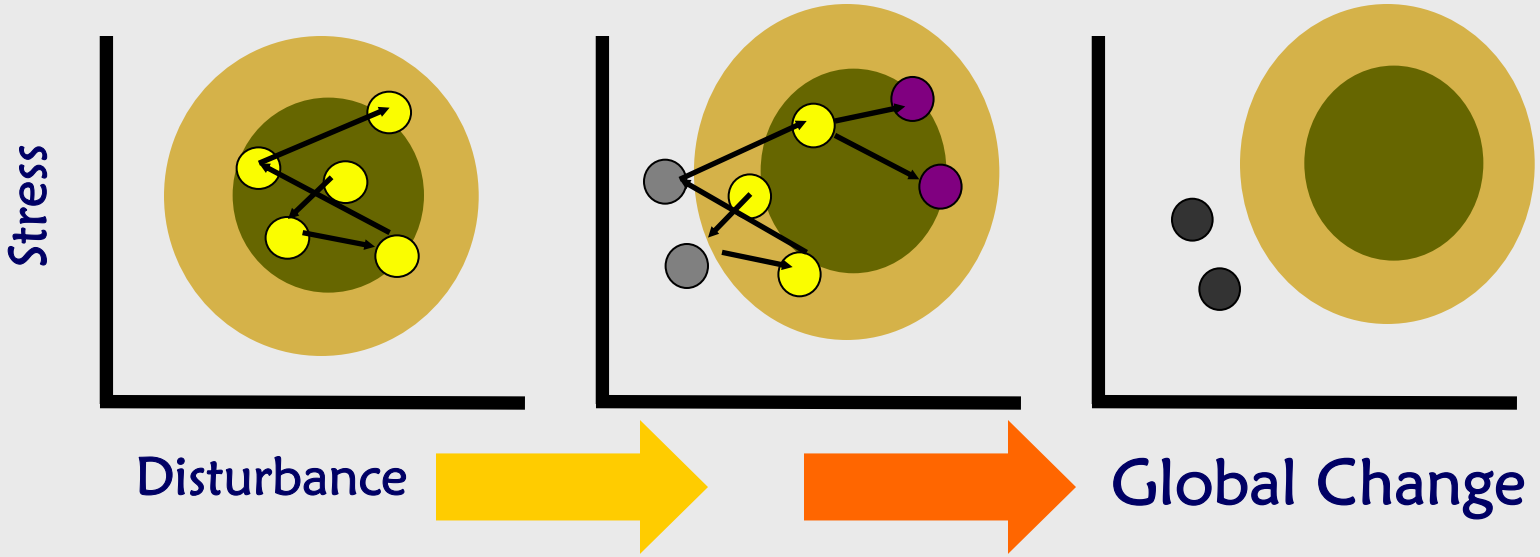
Unnatural Preservation

"In the age of global warming, public-land managers face a stark choice: They can let national parks and other wildlands lose their most cherished wildlife. Or they can become gardeners and zookeepers."

High Country News 2/2008

Restoration & Climate Change

Will Current Practices Fit as Conditions Change?



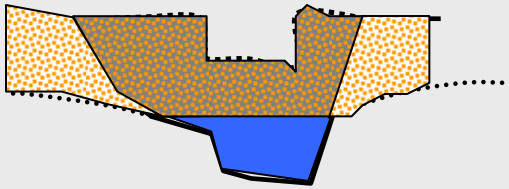
What is the likelihood that restoring historic ecosystems will be feasible given the altered biophysical conditions of the future?

J. Harris, R. Hobbs, E. Higgs, and J. Aronson Restoration Ecology 2006

Restoration & Climate Change

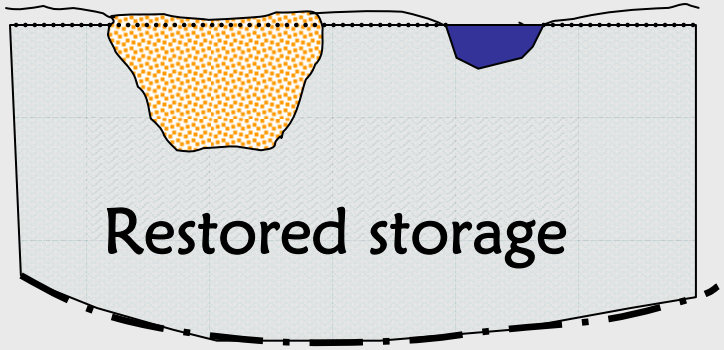
Management Response

Entrenched channel

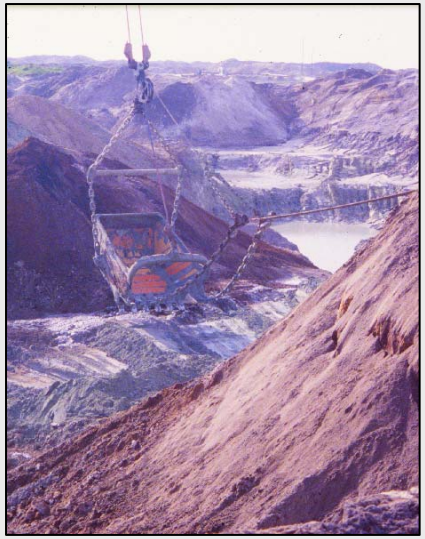


"Lost" storage

Restored channel



Is Restoration Genuine or Fake?



Humans cannot create real natural systems, they can only *Create Simplified Replicas*.

The concept of restoration *Implies that Any Habitat Destruction Can Be Remediated*.. This permits habitat destruction in some areas since mitigation in other areas will "balance" overall loss.

You cannot step into the same river twice

Every river is unique:

Their components continually change through complex interconnection with one another.

In other words:

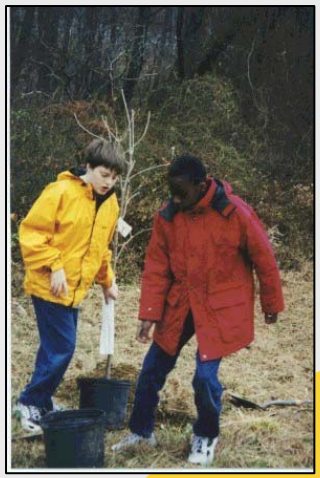
The waters are always changing, the rivers stay the same.

Constant change defines rivers

Heraclitus (ca. 535-475 BC)

http://www.iep.utm.edu/h/heraclit.htm

Defining Restoration Success



Stakeholder Success
Aesthetics
Economic Benefits
Recreation
Education

Most Effective Restoration

Ecological Success
Desired Condition Achieved
Ecological Improvement
Self-Sustaining
No Lasting Harm

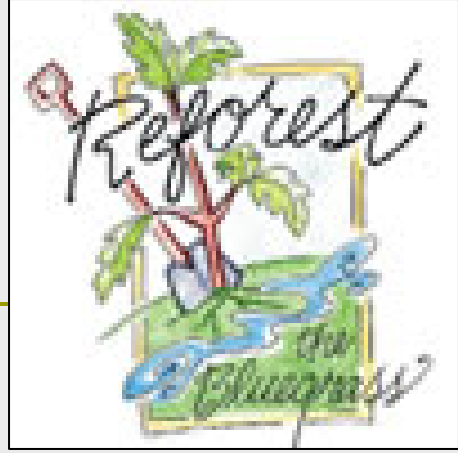
Learning Success
Scientific Contribution
Management Experience
Improve Methods

Palmer et al. 2005. J of Applied Ecology 42: 208-217

Reforest the Bluegrass

Lexington, Kentucky

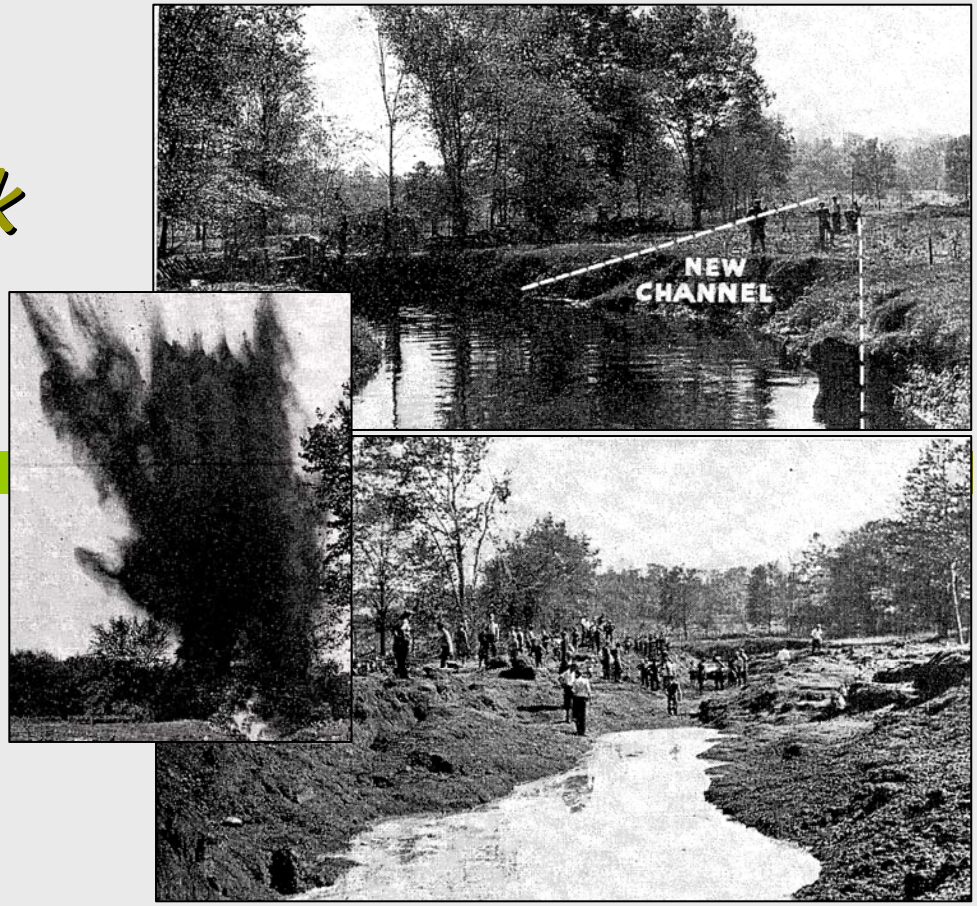
> 5,000 volunteers (Since 1999)
> 150 acres of floodplains were restored.
> 130,000 tree seedlings planted.
< $105,000 of local government funds
\+ $75,000 of donated funds.



Functional Objectives:

Filter pollutants - cleaner drinking water
Shade streams – reduce temperatures
Increase DO
Stabilize creek banks
Slow / Retain flood waters
Cool the city
Provide wildlife habitat & mosquito control

Restoration
of the Tangled Bank

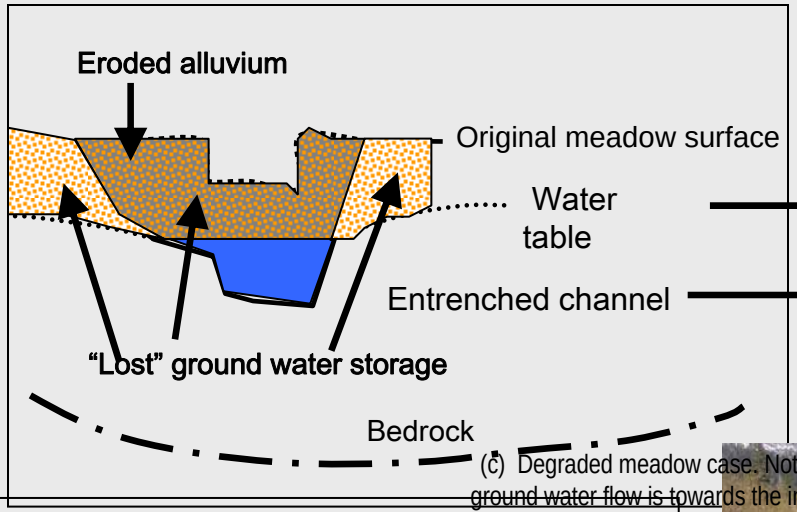


Chuck Rhoades
Rocky Mountain Res. Sta.
Ft. Collins, Colorado

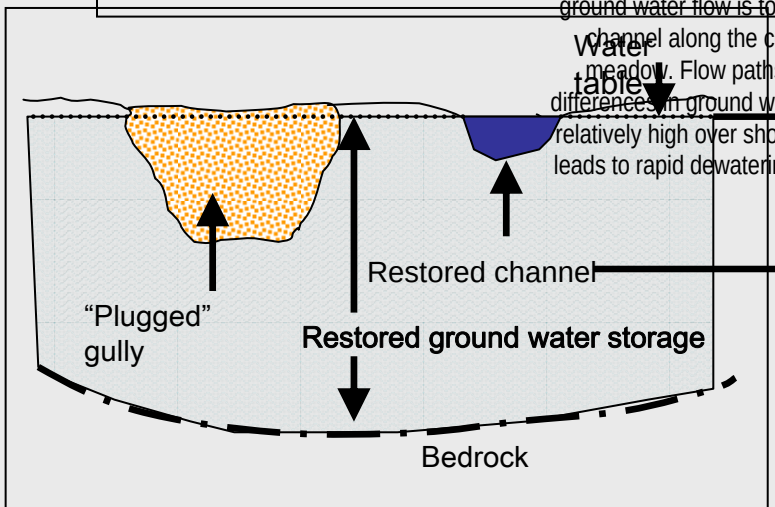
FOREST SERVICE
US
DEPARTMENT OF AGRICULTURE

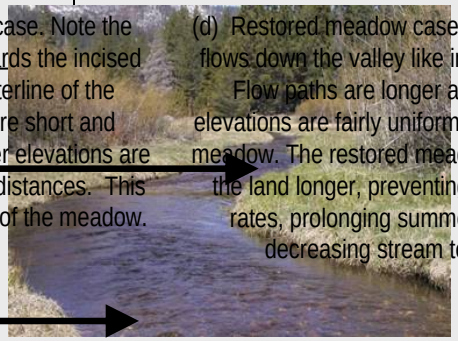
Rocky Mountain Research Station

How DYNAMITE *streamlines streams*



(c) Degraded meadow case. Note the ground water flow is towards the incised channel along the centerline of the meadow. Flow paths are short and differences in ground water elevations are relatively high over short distances. This leads to rapid dewatering of the meadow.





(d) Restored meadow case. Here, ground water flows down the valley like in pristine meadows. Flow paths are longer and ground water elevations are fairly uniform in the majority if the meadow. The restored meadow retains water on the land longer, preventing high evaporation rates, prolonging summer low flows, and decreasing stream temperatures.

Thoughts to Ponder

Is Restoration a *Unique* land management paradigm?
Where is it Unique?

Do you find *Reference Conditions* useful for establishing management objectives?

How may **Climate Change** alter perceptions of Restoration?

How has Restoration *Changed Land Stewardship* activities?

Opportunities to *Pass along Learning* (Science/Stakeholders)?