

Two Non-Traditional Concepts about Large River Reference Conditions:

From Recent Experience on the
Upper Mississippi River

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Visualizing large, working river goals - perhaps this ...



but not this.




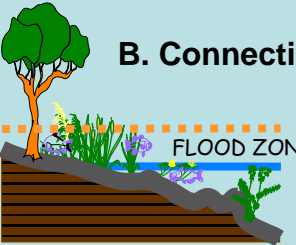
Basin Conditions


An Adaptive Management

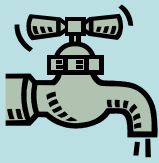


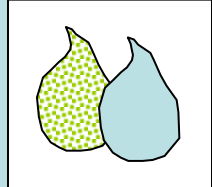
River Key Ecosystem Attributes

A. Bio-relationships 

B. Connectivity 

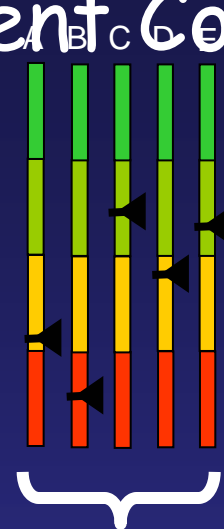
C. Habitat 

D. Flow 

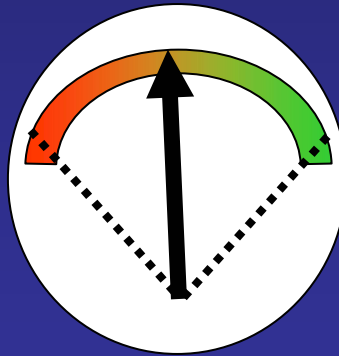
E. Water Quality 



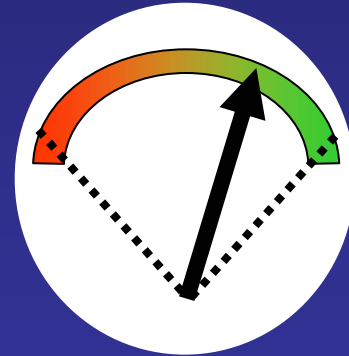
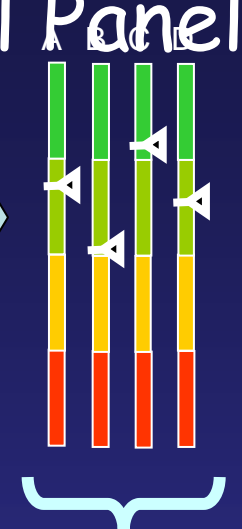
Indicators



River Ecosystem Health



Indicators



Today -

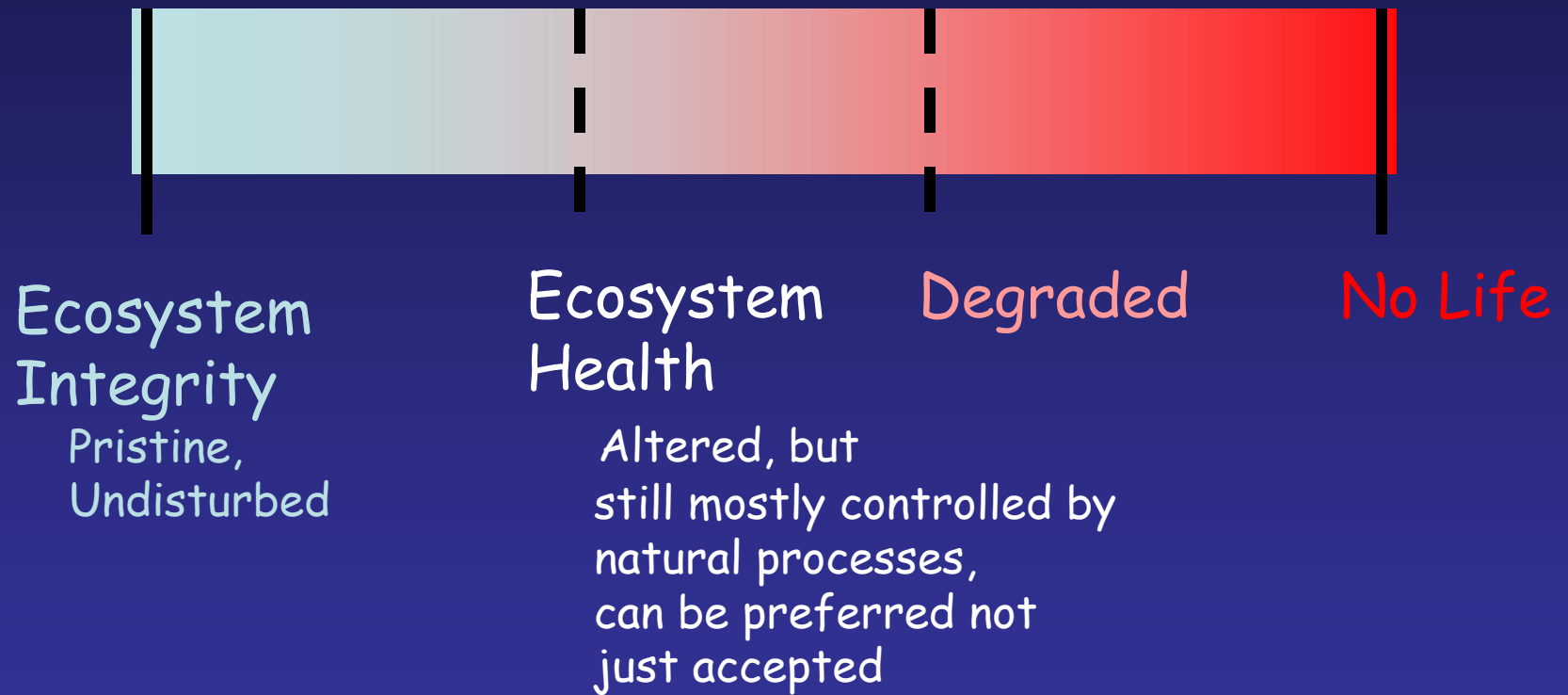
1. "Virtual Reference Condition"

2. "Collective Minimal Standards"

Almost Equal Phrases on the Upper Mississippi River

"Virtual
Reference
Condition" ?
= "Desired
Future
Condition" ?
= "River
Ecosystem
Health"

Spectrum of Ecosystem Conditions*



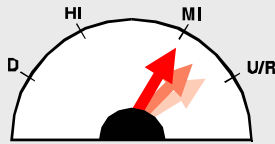
* Modified from Karr and Chu (1999)

Ecological Assessments of Three Reaches of the Upper Mississippi River

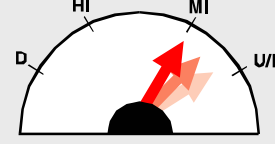
Ecosystem Criteria

1. Viable native populations and their habitats

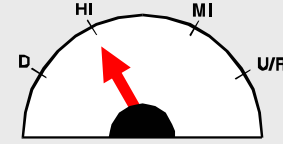
Upper Impounded Reach (Pools 1-13)



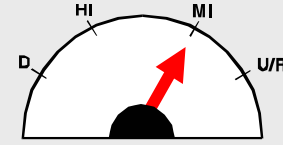
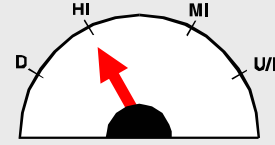
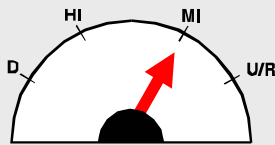
Lower Impounded Reach (Pools 14-26)



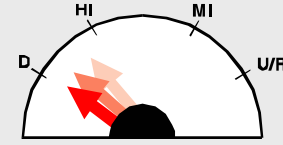
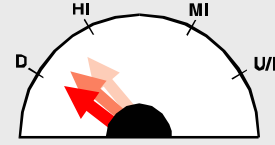
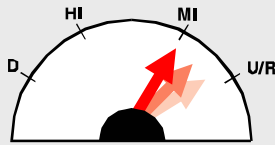
Un-Impounded Reach (St. Louis to Cairo)



2. Ability to recover from disturbance

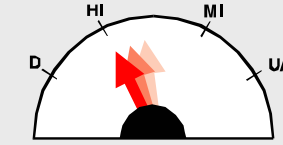
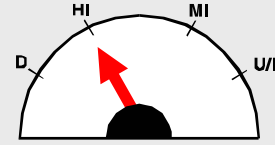
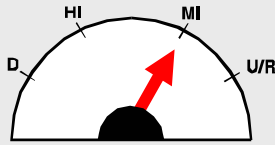


3. Sustainability

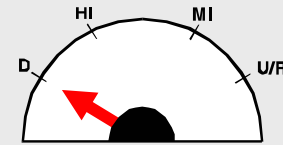
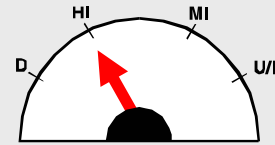
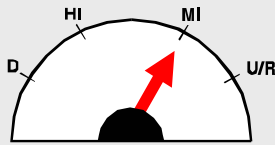


Floodplain River Criteria

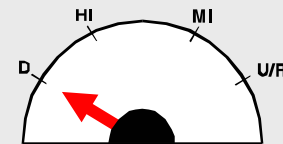
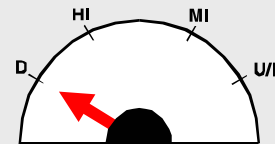
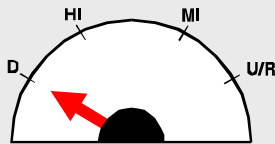
4. River provides basin services



5. Annual channel/floodplain connectivity



6. Long-term structural dynamics (such as meandering)



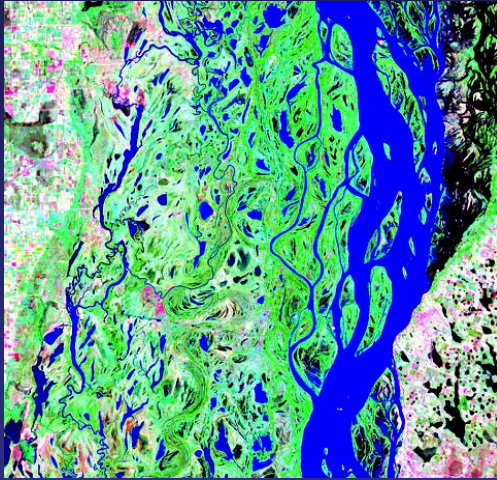
Problems with Initial "Report Card":

1. Limited quantitative methods
2. Limited participation by public

Reference Conditions

(ala J. Nestler at International Aquatic Modeling Group, 2000-2001)

Middle Paraná River



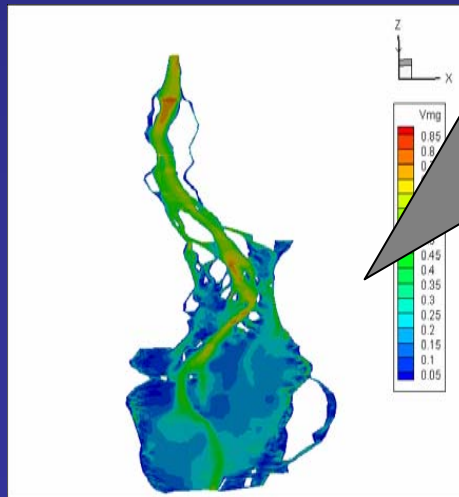
Existing River



Historical River



Virtual Reference



NSF

Existing Reference



2

1

3

4

Nestler's Virtual Reference Condition concepts -

1. Needed to bridge gap between incremental and synthetic approach
2. Multi-variable and based on first principles
3. From model calibrated to historic states, internal sites, and external systems.

Question #1: How many variables does it take to adequately address first principles?

But, the actual UMR recipe (FOR V.R.C) -

1. Take 2000+ stakeholder needs ...
2. Blend and reduce
3. Separate by essential ecosystem characteristic
4. Present as pseudonym for total "desirable future conditions"

Question #2

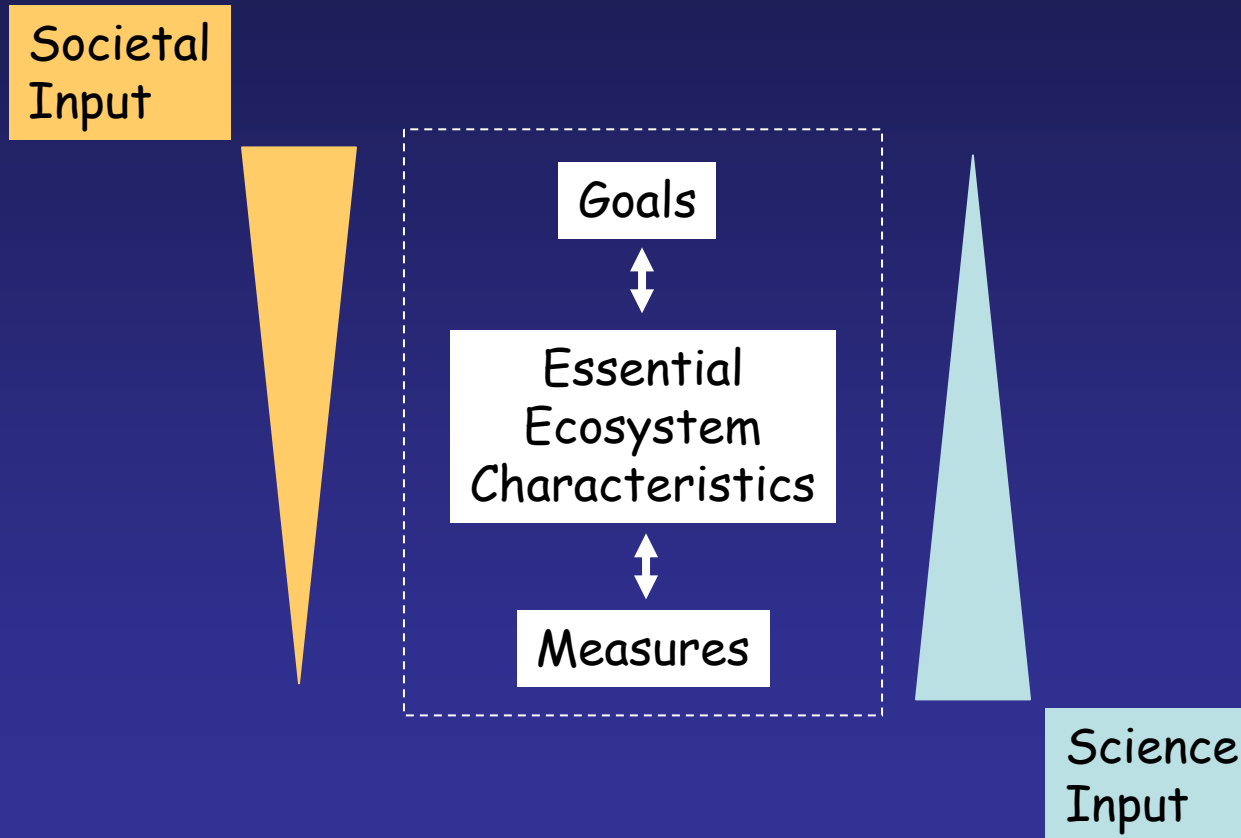
Is establishing the

"Virtual Reference Condition"

an objective or subjective task?

Getting the Goal-setting Process Right -

AN ECOSYSTEM REPORT CARD NEEDS TO BE
SCIENTIFICALLY-CREDIBLE AND
SOCIAALLY ACCEPTABLE

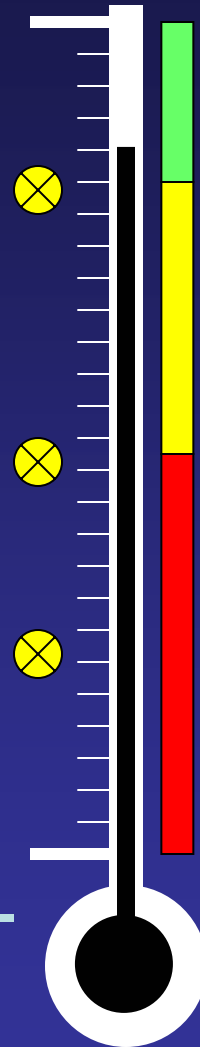


Source: Harwell, et al. (1999)

Science and Public Contributions

USGS →

Units
(ie. mg/l)



Desirable

Concern

Unacceptable

TNC
And
Other
Stakeholders

Objective

Subjective

Measurable
Indicator
of an EEO
Characteristic



Response Threshold

Virtual Reference Condition Approach 1: Based on History

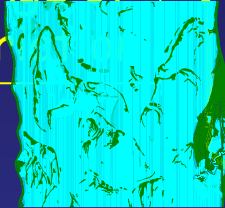
1890



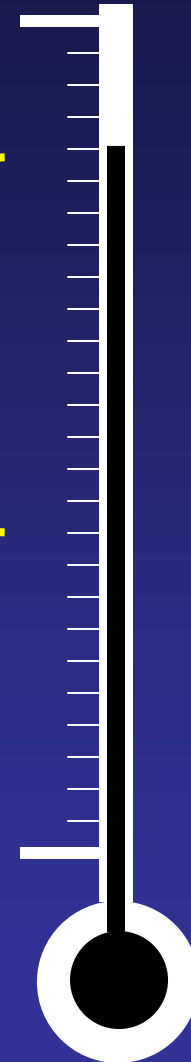
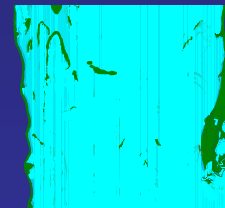
His
Range of
Var



1939



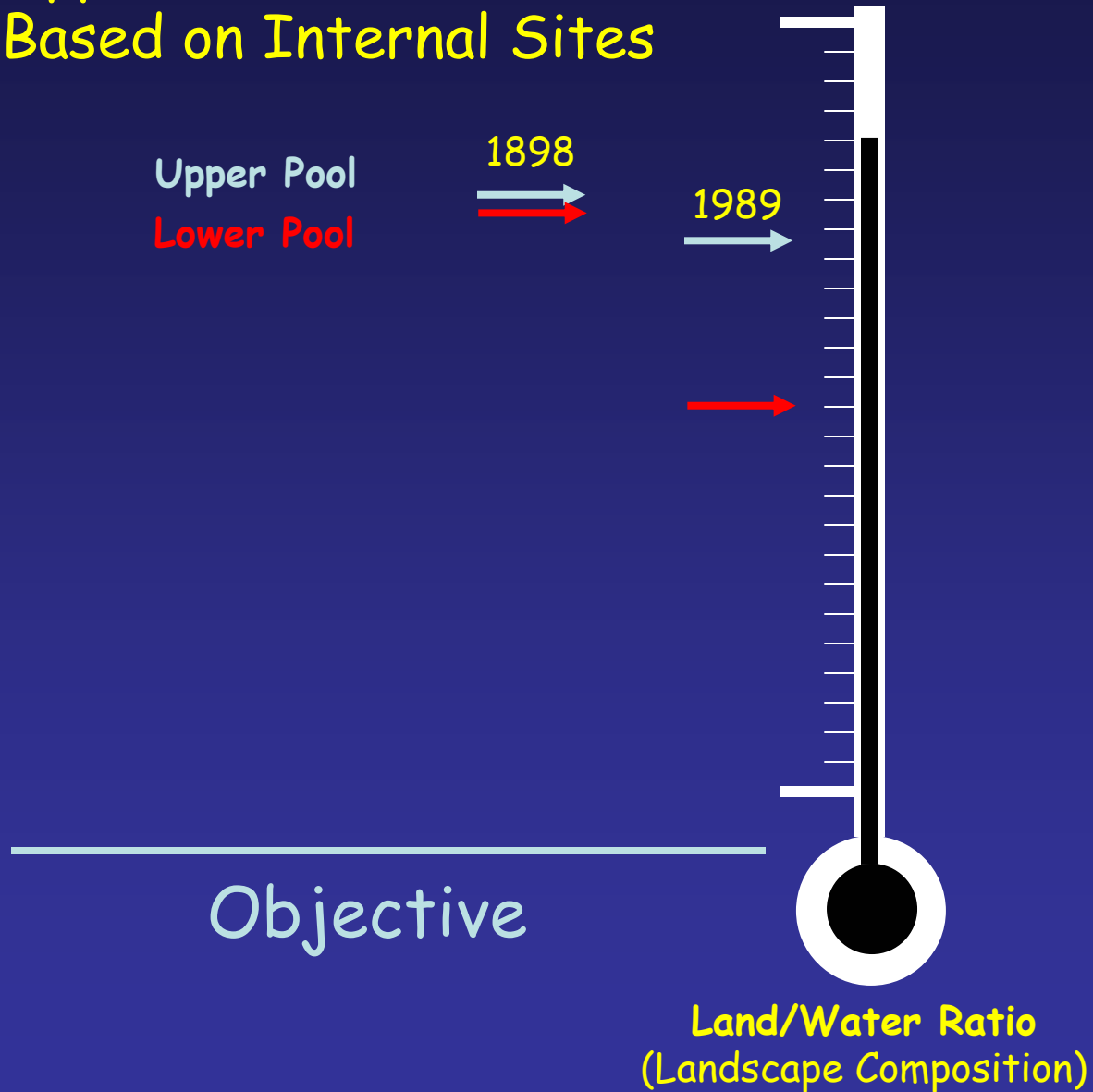
1989



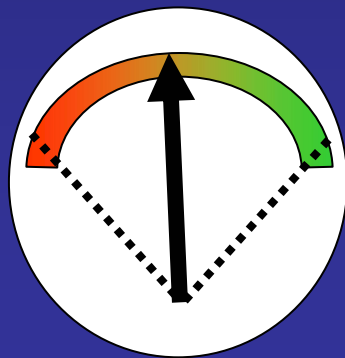
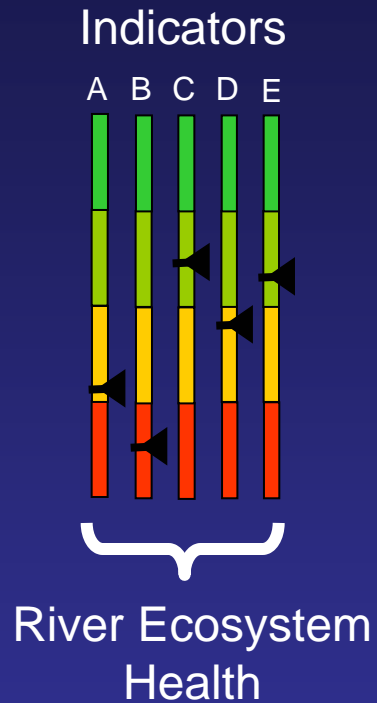
Objective

Land/Water Ratio
(Landscape Composition)

Approach 2: Based on Internal Sites



But what happens when we try to synthesize variables?



mg/l
+ acres
+ invasive species
+ ..
+ ..

???

Question #3: Can a Multi-variable approach be Objective?

"Collective Minimal Standards"?

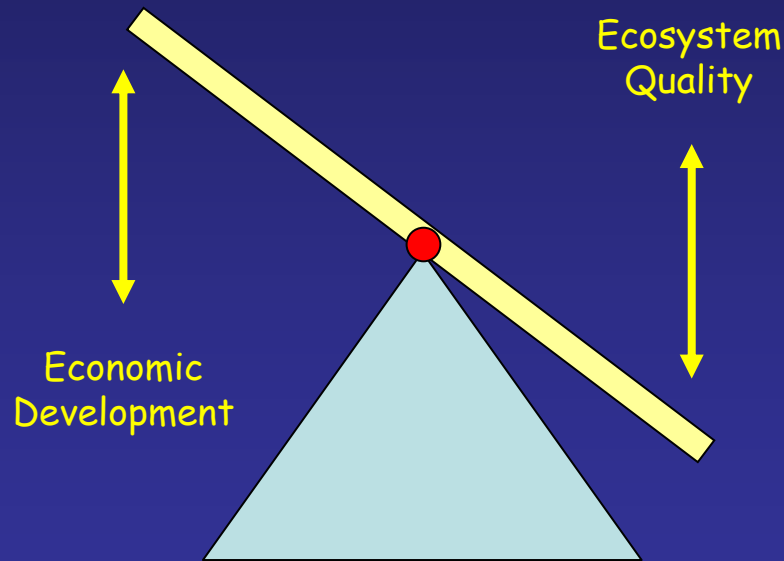
The UMR Navigation-Ecosystem Sustainability Program (N.E.S.P.)

Goal = Economic and Ecosystem Sustainability

Scope of TNC's Great Rivers Center for Conservation and Learning

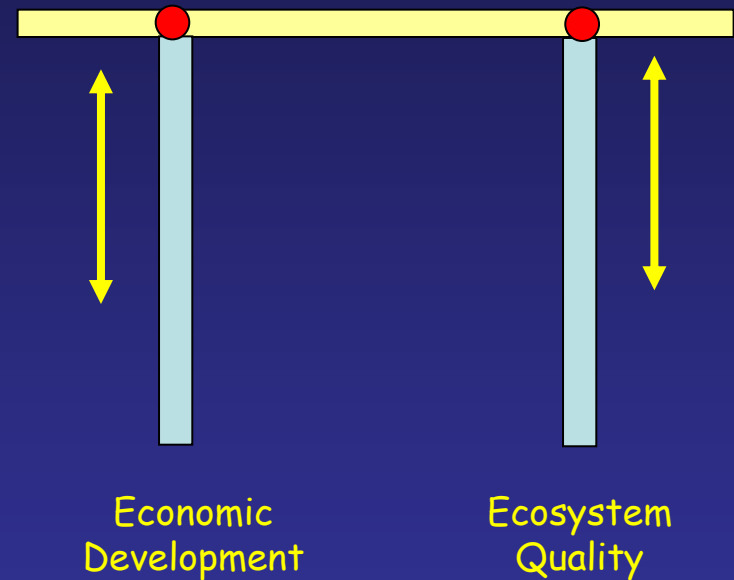
Total
System Quality = $f(\text{economy}) + f(\text{ecosystem}) + f(\text{culture})$

Two Models of Economic/Ecosystem Relationships



(a)

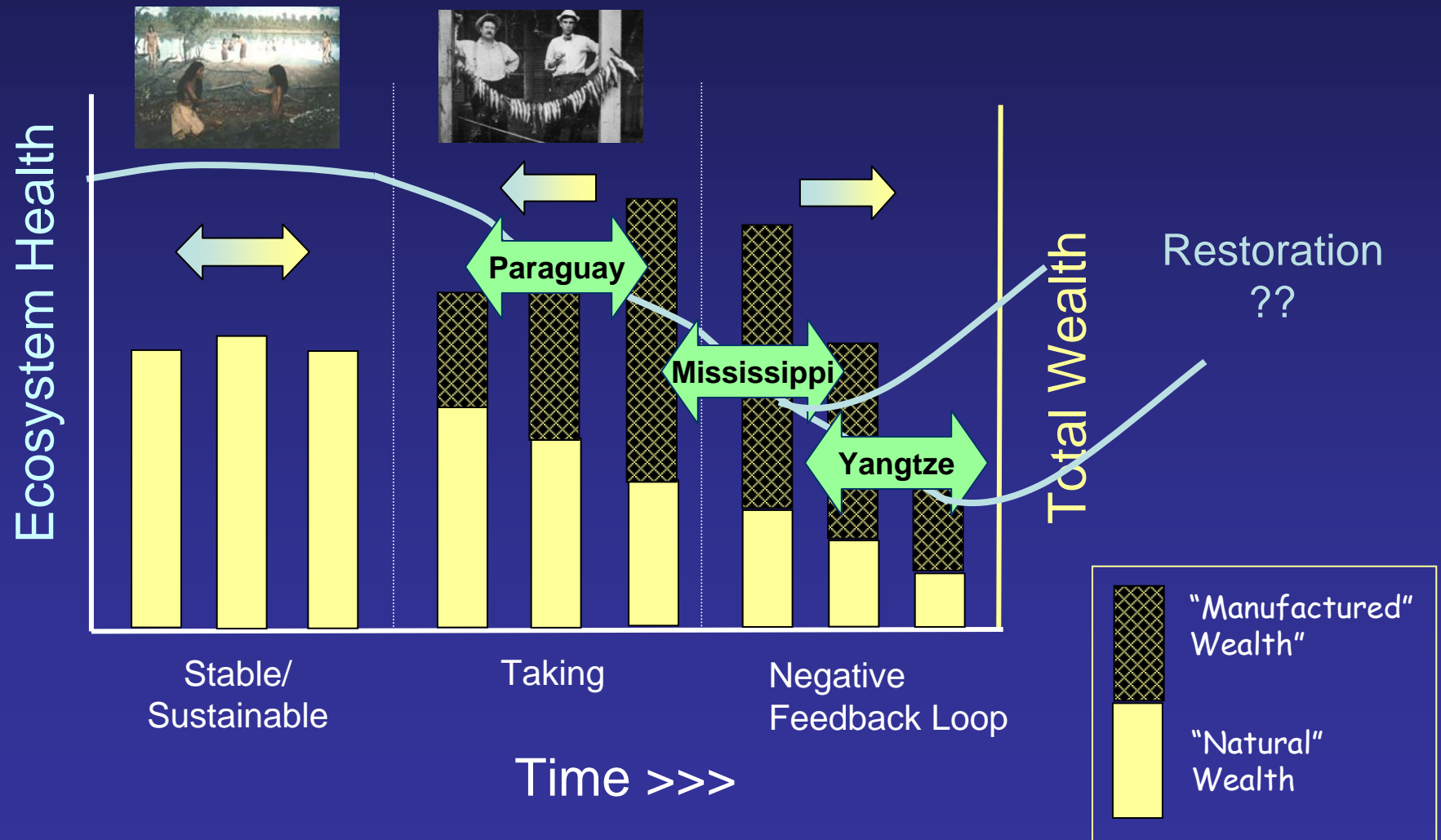
Co-dependency



(b)

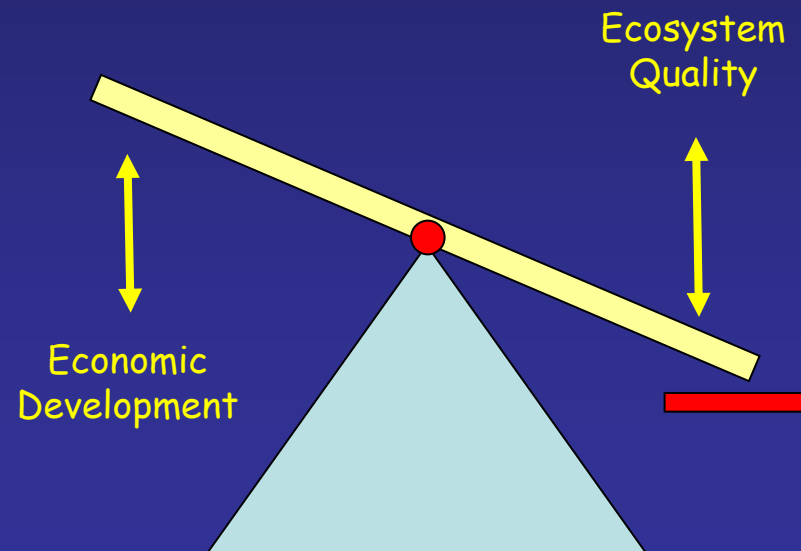
Independency

Theoretical Health/Wealth Relationships During 3 Stages of Natural Resource Use



Question #4: Under the co-dependency model -

Don't we have to establish minimally acceptable standards as well as objectives?



Review of Questions:

1. Do reference conditions have to be **objective**?
2. **How many** variables are necessary to adequately address first principles?
3. Can a **multi-variable approach** be objective?
4. **Minimal standards** as well as objectives?