

# Environmental Problem Solving...

## The Role of Lateral Thinking



OCLWA  
Annual Conference  
April 18, 2013

Ray West

# New Think...

(very old think)



Vertical thinking  
vs  
Lateral thinking

# Vertical thinking

(logical thinking)

Logical step 1



Logical step 2



Logical step 3



One correct solution

(exclude the wrong)

Selective process



# Lateral thinking

Methods of thinking concerned with  
changing concepts and perception

— Edward de Bono

- The brain is not intended for creative thinking



- The brain's power is in forming patterns  
and sticking to these patterns

so

- To become creative you need to block  
normal channels and “cut across patterns”  
in a self-organizing information system

Generative Process



Emphasizes dangers of  
rigid patterns



# Explaining Lateral thinking

- Mind is like mud – grooves are formed where water/thoughts run.
- Need to form new avenues.

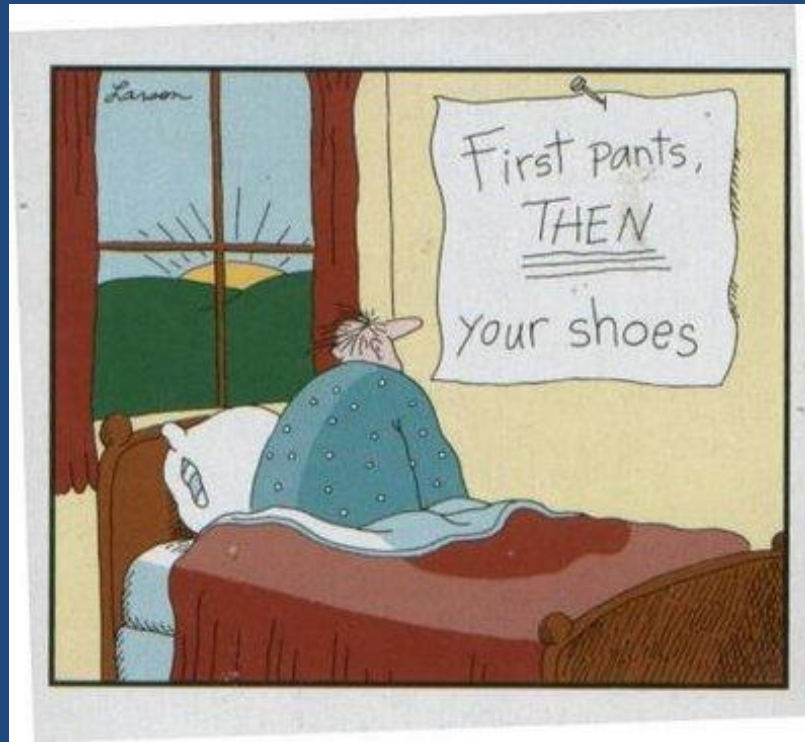


*Discovery consists of looking at the same thing as everyone else and thinking something different*

— Albert Szent-Gyorgyi, Nobel Prize Winner







Obviously, this guy is not getting stuck in patterns.

I wouldn't bet against him for being a good lateral thinker!

# 4 critical factors associated with lateral thinking



1. Recognize dominant ideas that polarize the perception of a problem
2. Search for different ways of looking at things
3. Relaxation of rigid control of thinking
4. Use of chance to encourage other ideas





Many problems require a different perspective to solve successfully

— *Edward de Bono*



For example...



Dick Fosbury



WORLD'S LAZIEST HIGH JUMPER



Dick Fosbury



WORLD'S LAZIEST HIGH JUMPER

Think about it – for animals, all the important means of fleeing and chasing were established early on. Jumping your highest over obstacles one would think should be one of those basic fleeing and chasing movements.

But Fosbury comes up with an upside-down and backward leap over a high bar when he was only 15.





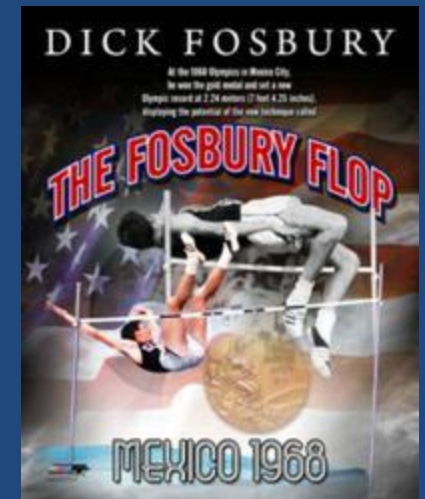
Dick Fosbury



WORLD'S LAZIEST HIGH JUMPER



1968





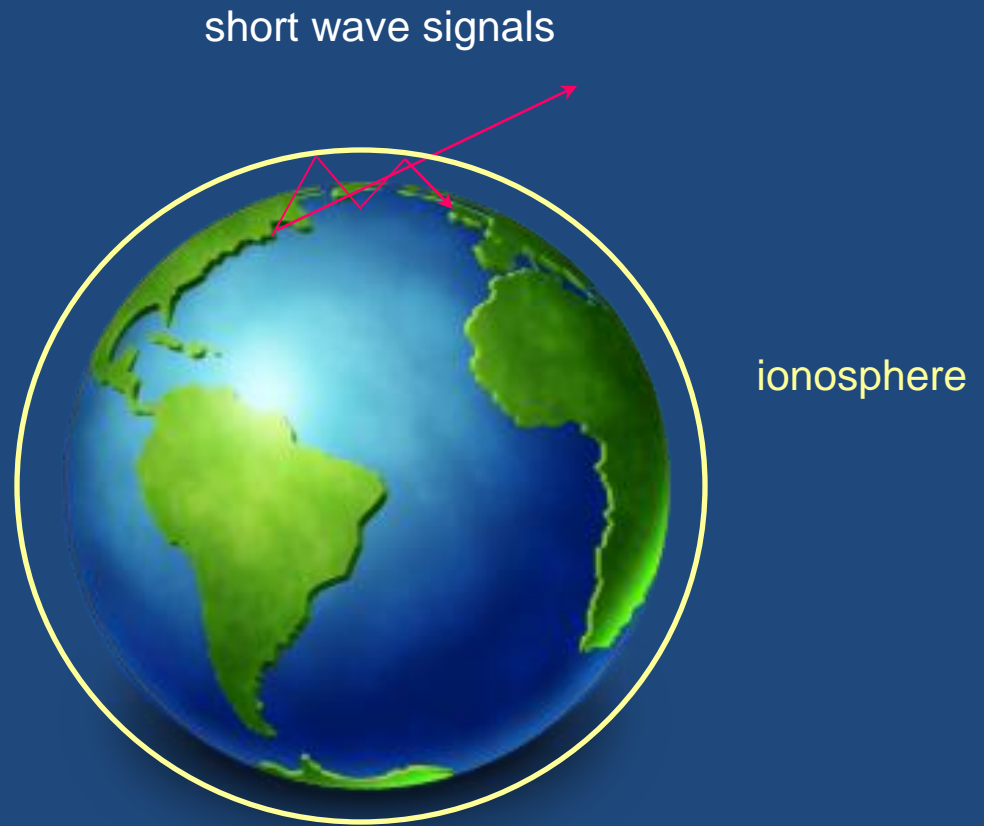


Marconi





Marconi



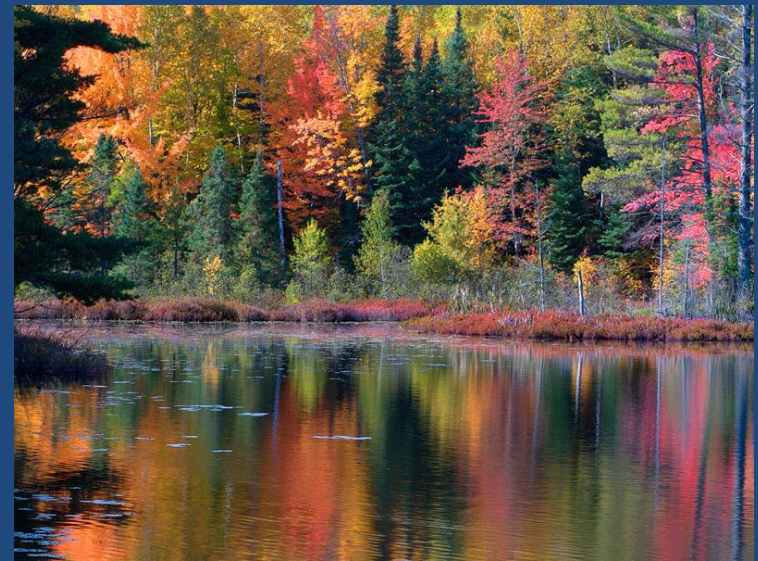
The experts laughed at the idea of transmitting a signal across the Atlantic Ocean. They assured Marconi that since short wave signals, like light, travel in straight lines, they would not follow the curvature of the earth, but would stream off into space. Logically, the experts were quite right.

Marconi went up to Newfoundland and tried it anyway. By being wrong, Marconi arrived at a conclusion he could never have reached had he been rigidly logical all along.

# A swim in the River Cherwell



# Increasing chances for lateral thinking

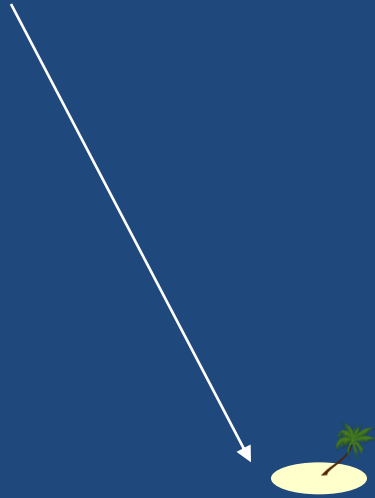


- Being open minded  
(examine different viewpoints)
- Breaking down silos (agency, profession, rank, degree, experience)
- Reading everything ! Not just within your field
  - can help in cases when you can't collaborate
  - it's the most powerful tool at your disposal

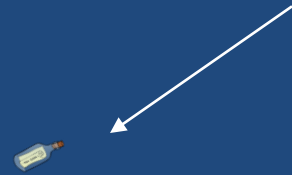
*We can't solve problems by using the same kind of thinking we used when we created them*

*— Albert Einstein*

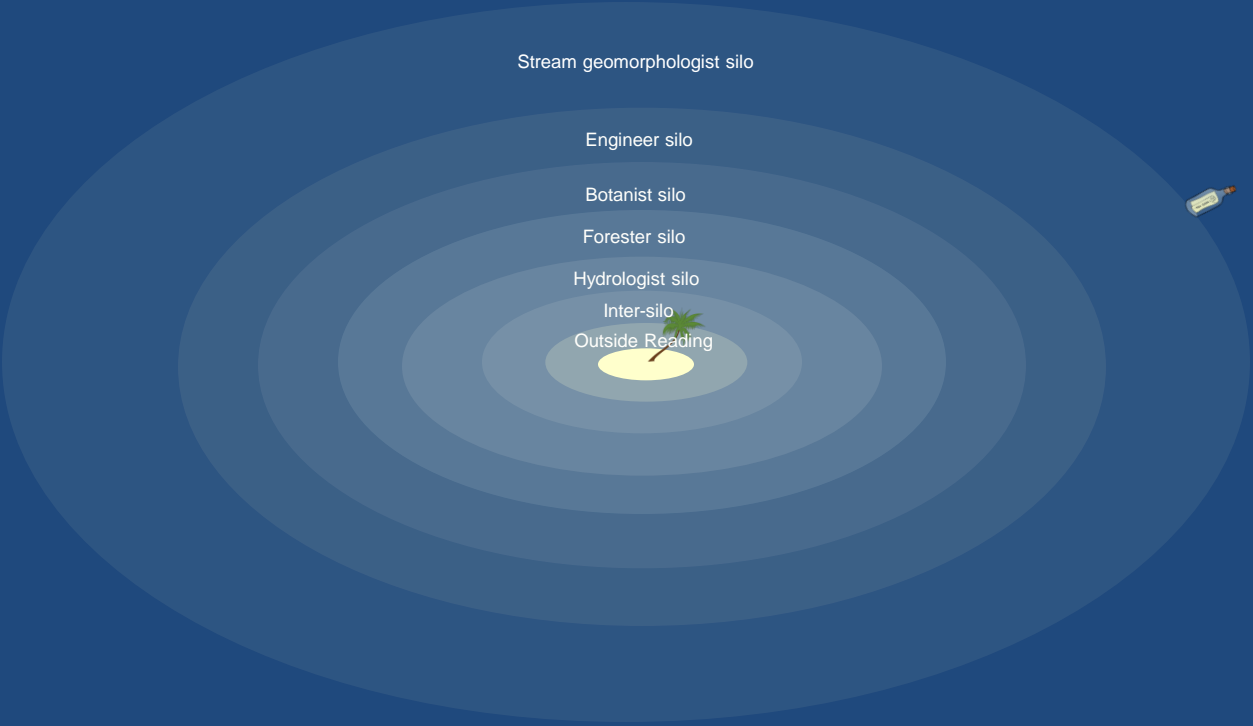
Chances of lateral thinking to occur

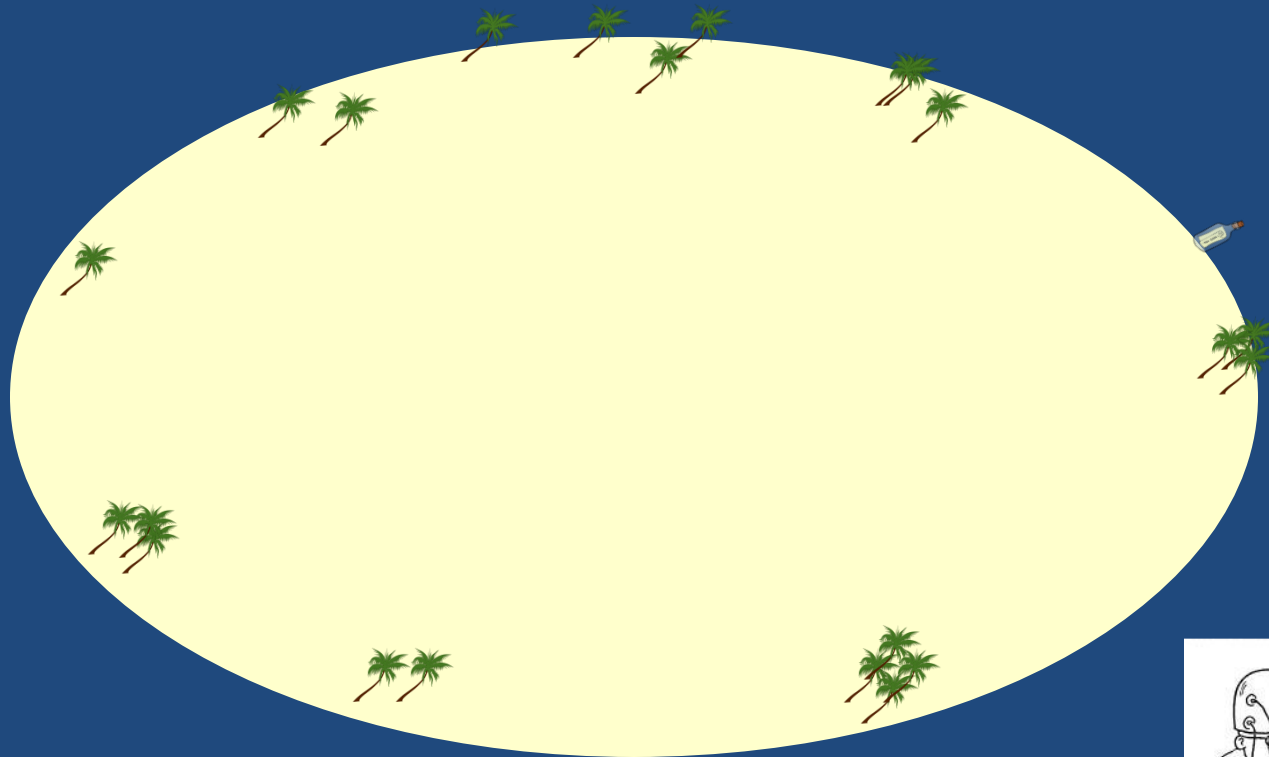


Creative good idea









Aha !



"Frankly, I'm not sure this whole idea-sharing thing is working."

# Solving “Potential” Environmental Problems

## Solving “Existing” Environmental Problems

Which one is more  
important ?

Wrong question

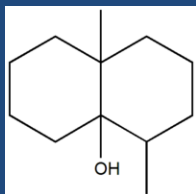
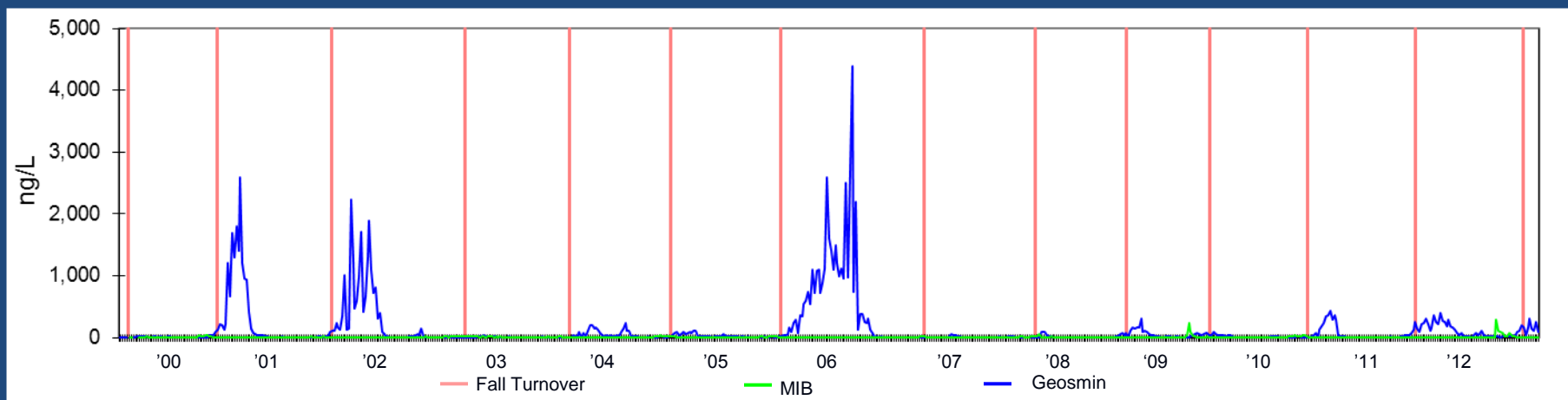


# Solving “Potential” Environmental Problems

Not as dramatic, memorable, etc.....

More common

Tulsa reported one of the worst T&O problems in the country....(AP, 2000)



Geosmin detected by human taste & odor senses at 5–10 parts ppt !





Joan Arthur

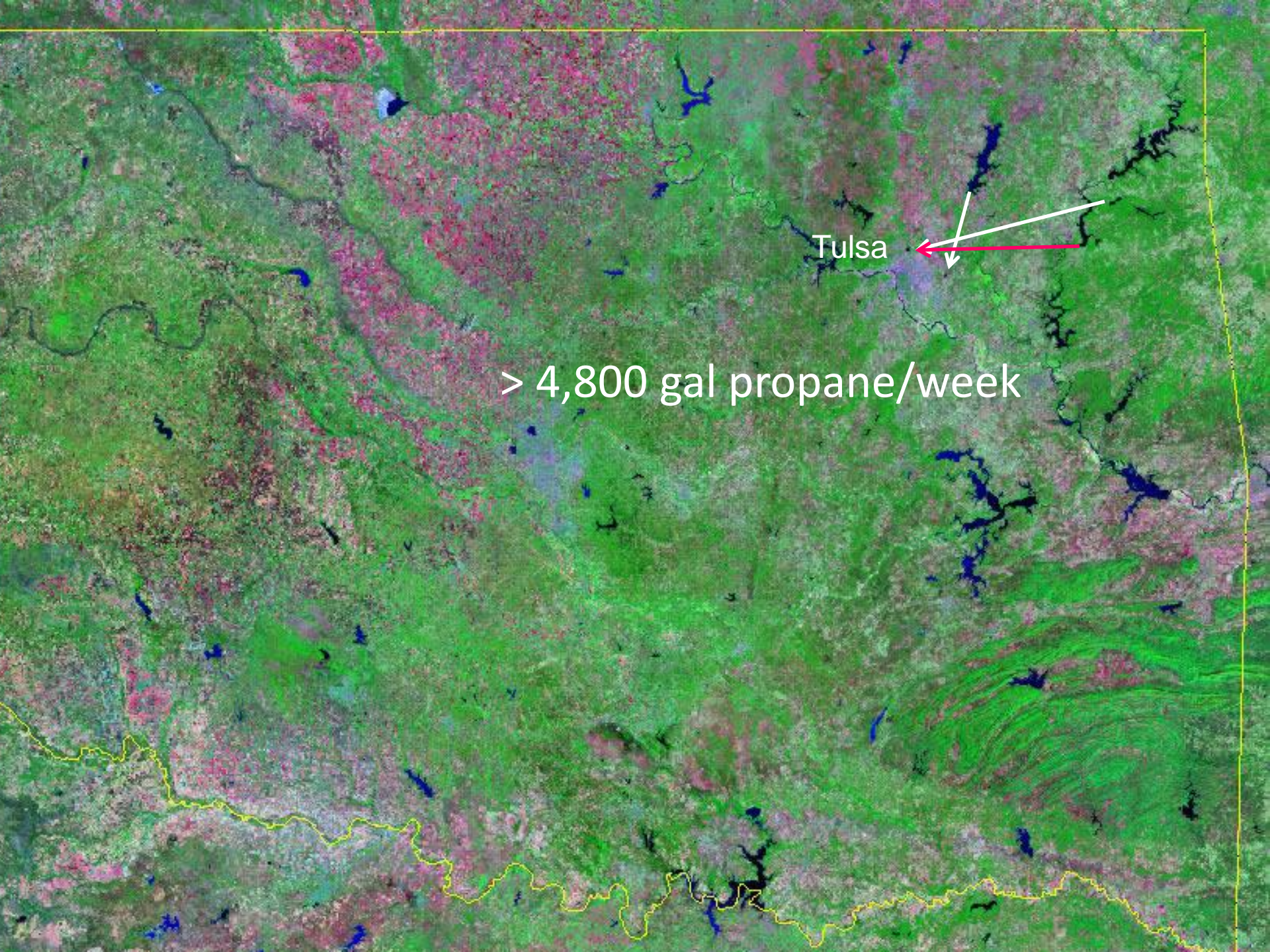


Cu<sup>++</sup> in raw water line ~ 7 mi from WTP



*Anabaena circinalis*





Tulsa

> 4,800 gal propane/week





Joan Arthur



Cu<sup>++</sup> in raw water line ~ 7 mi from WTP



*Anabaena circinalis*

2000/2001 [ Geosmin = 2,800 ppt  
Abandon Spavinaw L and use L Hudson



Bob Brownwood



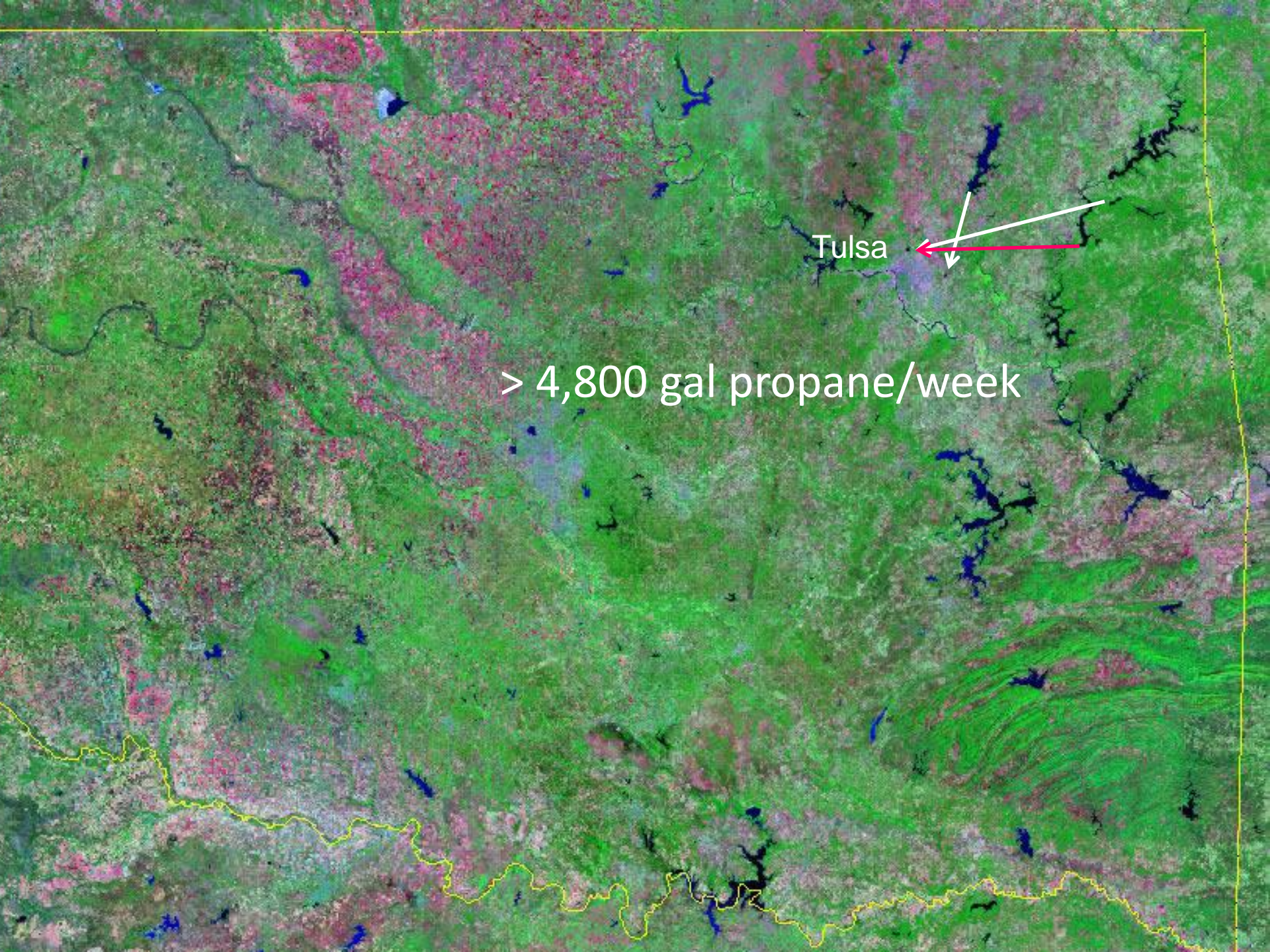
Cu<sup>++</sup> in dam flowline  
(~57 mi from WTP)



2005/2006 [ Geosmin = 4,400 ppt

How on earth does this solve an environmental problem ?





Tulsa

> 4,800 gal propane/week





Imagine you've been dropped on planet earth and you land near a tarn. One of the first things you probably think about is the source of water you can drink.



But you may not be so lucky. You may be dropped on planet earth near a waterbody like this. Humans instinctively run through some basic questions in their heads when deciding whether or not to drink the water. Questions such as “Does it look bad?”, “Does it smell bad?”, and “Does it taste bad?”



- Humans living in cities and downs are no different....  
  
they make those same basic decisions that one would if he or she was out in the boonies, when deciding on whether of not to drink the water.
- If any of these basic questions are answered in the affirmative, the public will turn to alternative sources of water (e.g. bottled water).
- So, we don't want to add any more to these following numbers.



# United States 2012



- 69.950 billion bottled water bottles used
- 132.9 billion pounds of plastic from bw (87% going to landfills)

- 36,916,667 barrels of oil used to make bottled water bottles

(enough gas for 2,461,111 cars)



Circle earth ~354 times !  
~18.5 round trips to the moon !



## More footprint costs...

- Cost up to \$20.00 per gallon to purchase (specialty waters even higher)\*
- Uses 2 to 6 gallons water to make 1 gallon bw
- Uses ~ 1 gallon gas per gallon of bw sold
- 50% of bottled water source is Municipality
- Emits 4-1/2 lbs greenhouse gases per gallon bw
- Less restrictive water quality standards\*\*

\*If you bought water at the 2007 Tulsa PGA Championship you paid \$28.80/gallon

\*\*However, market forces necessitate potentially equal quality



January – May

(aka “The Silly Season”)

2001

# SB 627 Credible Data Act

(aka “The Incredible Data Act”)



2001

## SB 627 Credible Data Act

(aka “The Incredible Data Act”)



Only collection methods that meet state guidelines developed by a state can be credible

Inserts state agencies, along with their specific agendas and constituencies , into the data collection process

All historical data older than 5 – 10 years be justified

M. Susan Savage  
MAYOR  
+  
918 • 596 • 7411



OFFICE OF THE MAYOR  
200 CIVIC CENTER + TULSA, OKLAHOMA + 74103

May 29, 2001

The Honorable Frank Keating  
Governor, State of Oklahoma  
State Capitol Building  
Oklahoma City, Oklahoma 73105

Dear Governor Keating:

Please veto Senate Bill 627, the Credible Data Act. Your support in preserving the source water for Tulsa and surrounding communities as well as your efforts to sustain water quality have been greatly appreciated. However, Senate Bill 627 has the potential to seriously erode the positive steps taken to date.

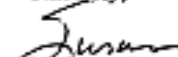
The bill creates confusion as to what does or does not qualify as credible data. Currently, four agencies have authority to conduct studies and make determinations regarding the impairment of water bodies in Oklahoma. All are required to conduct water quality studies using common methodologies. This bill does not place any one agency in charge and does not standardize data but requires each agency to implement its own process.

Senate Bill 627 also ignores current standards established for stream and lake investigations. It requests that all historical data older than five to ten years be justified, making it more difficult to document the degradation of water bodies due to increased pollution run-off from poultry farms. This creates obvious concern as we struggle to address water quality in the Eucha-Spavinaw watershed.

Enclosed for your review is the vote ledger from the Oklahoma House of Representatives. I urge your veto of this bill and offer any assistance with additional information you may require.

Thank you for your consideration.

Sincerely,

  
M. Susan Savage  
Mayor

cc: Tulsa City Council  
Tulsa Legislative Delegation  
Tulsa Metropolitan Utility Authority Members

## OBJECTIONS TO SB 627 CREDIBLE DATA ACT



**Only data collection methods that meet guidelines developed by a state agency can be credible.**

Water quality regulation is so fragmented among agencies that 1 lake or stream could have multiple COMPETING and CONFLICTING guidelines for the collection and use of data.

Right now, data collection is done according to an EPA protocol that does not involve a state agency set of guidelines. The process is objective and scientifically based.



**The Act inserts state agencies, along with their specific agendas and constituencies, into the data collection process.**

Data should not be rejected because of WHOM it affects or WHAT INDUSTRY or ACTIVITY causes the pollution.

The current protocols for data collection assure the highest quality of scientific data.



**Working groups such as the Oklahoma Water Quality Management Committee are addressing data quality and uniformity already. The group includes members from state agencies and councils of government.**

While all citizens should have input into the ultimate decision to list or de-list streams, data collection should be performed according to the most objective scientific standards.



**The Act was written to address a problem Oklahoma does not have.**

As late as 1990, EPA encouraged agencies to list streams so that they would qualify for federal funding. Consequently, streams were listed with little or no data showing a pollution problem. With the adoption of Uniform Protocols, streams cannot be listed or de-listed with adequate data backing up the decision.

Power of the pen !



Governor vetoes act

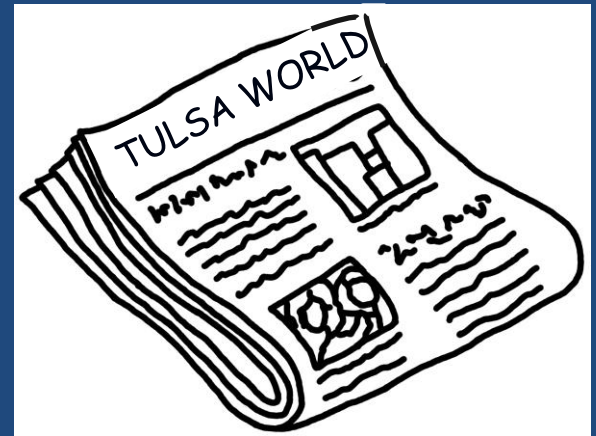


A copy of letter was sent to Tulsa World

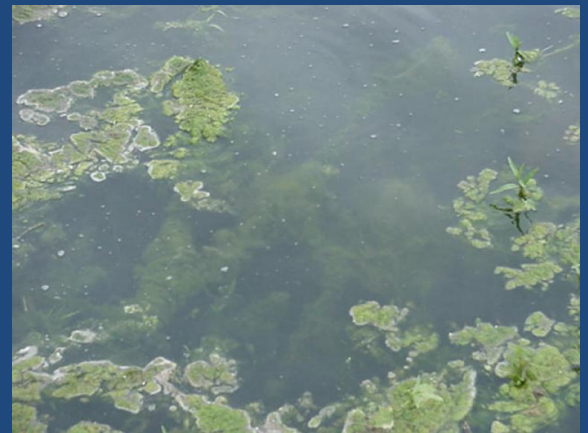
Governor gets favorable article in paper

Governor saves face

Polluters more accountable



## A different kind of problem....



What happens when terms of a lawsuit requiring reduction of poultry waste in a watershed expire and no TMDL has been developed by OK ?

Major tributaries had high TP conc.s, but no “scenic river” designation.

— Illinois River (AR-OK stateline) =  $0.037 \text{ mL}^{-1}$  TP

## 2003 Example of relaxation of rigid control of thinking

In tackling a problem, it's common to assume a set of limits within which the problem must lie.....

Asked the question....."What about a lake nutrient criteria ?"



Reviewed Clean Water Act



- Upstream states must comply with any downstream state's WQ criteria
- Didn't say downstream state criteria had to be for a stream.... just WQ criteria

Lake nutrient (P) criteria for Lake Eucha and Spavinaw Lake  
(Oklahoma's first and only lake nutrient criteria)

A different way of looking at things.....

2010

Tulsa stormwater quality manager

Too many samples to collect !  
(Since 1994)

What do you do with the data ?

We submit to EPA....it's required

But, what do you want do with the data ?





# Seasonal Kendall Test

## Stormwater Trend Analysis (1994- 2009)

	R-1			2-OC			3-NC			4-54 St			5-58 St		
	Seasonal Trend	Overall Trend	Percent Change	Seasonal Trend	Overall Trend	Percent Change	Seasonal Trend	Overall Trend	Percent Change	Seasonal Trend	Overall Trend	Percent Change	Seasonal Trend	Overall Trend	Percent Change
BOD		—			—			—			—			—	
CD		†			†			†			†			†	
COD		—			—		▲ ▲ ▲	▲	99.4		—		▲ ▲ ▲	▲	65
CU		†			†			†			—			—	
DIAZ		†			†			†			†			†	
FCOL		—			—			—			—			—	
HARD		—			—		▲ ▲ ▲	▲	65		—			—	
N-NH3		—			—			—			—			—	
NO2+NO3		—			—			—			—			—	
N-TKN	▲ ▲ ▲	▲	115	▲ ▲ ▲	▲	103		—			—		▲ ▲ ▲	▲	104
N-TN	▲ ▲ ▲	▲	76.9		—			—			—			—	
O&G		†			†			†			†			†	
P-DP		—			—			—			—			—	
P-TP		—			—		▲ ▲ ▲	▲	107		—		▲ ▲ ▲	▲	94
PB		—			—			—			—			—	
PH		—			—			—			—			—	
PHEN		††			††			††			††			††	
TDS		—			—			—			—			—	
TEMP		—			—			—			—			—	
TSS		—			—			—			—		▲ ▲ ▲	▲	117
ZN		—			—		▲ ▲ ▲	▲	166	▲ ▲ ▲	▲	99.4	▲ ▲ ▲	▲	147

— = no trend  
 ▲ = spring ▲ = summer/fall ▲ = winter  
 ▲ or ▲ or ▲ = weak trend  
 ▲ or ▲ or ▲ = strong trend  
 ▲ or ▲ or ▲ = strong trend  
 † = >50% of data is BDL  
 †† = discontinued analysis

1-R = Residential  
 2-OC = Old Commercial  
 3-NC = New Commercial  
 4-154 St = Industrial (54<sup>th</sup> St & Mingo Cr)  
 5-158 St = Industrial (9717 E. 58<sup>th</sup> St)

Alpha level: 0.01 for all trend tests

# Solving “Existing” Environmental Problems

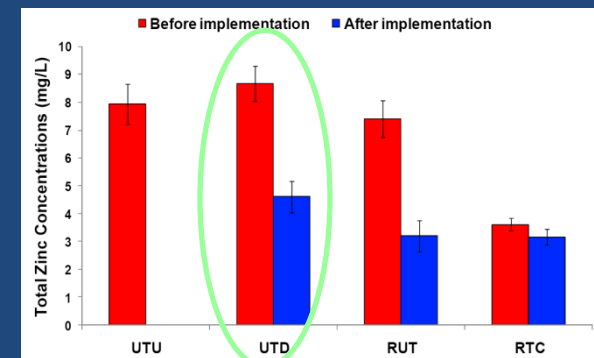
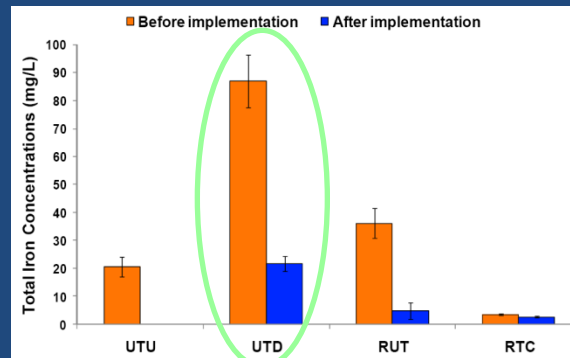
May conjure up images of problems like....

# Tar Creek Passive Treatment System (PST)

R.W. Nairn, K.A. Strvett, J.A. LaBar (University of Oklahoma)



2008

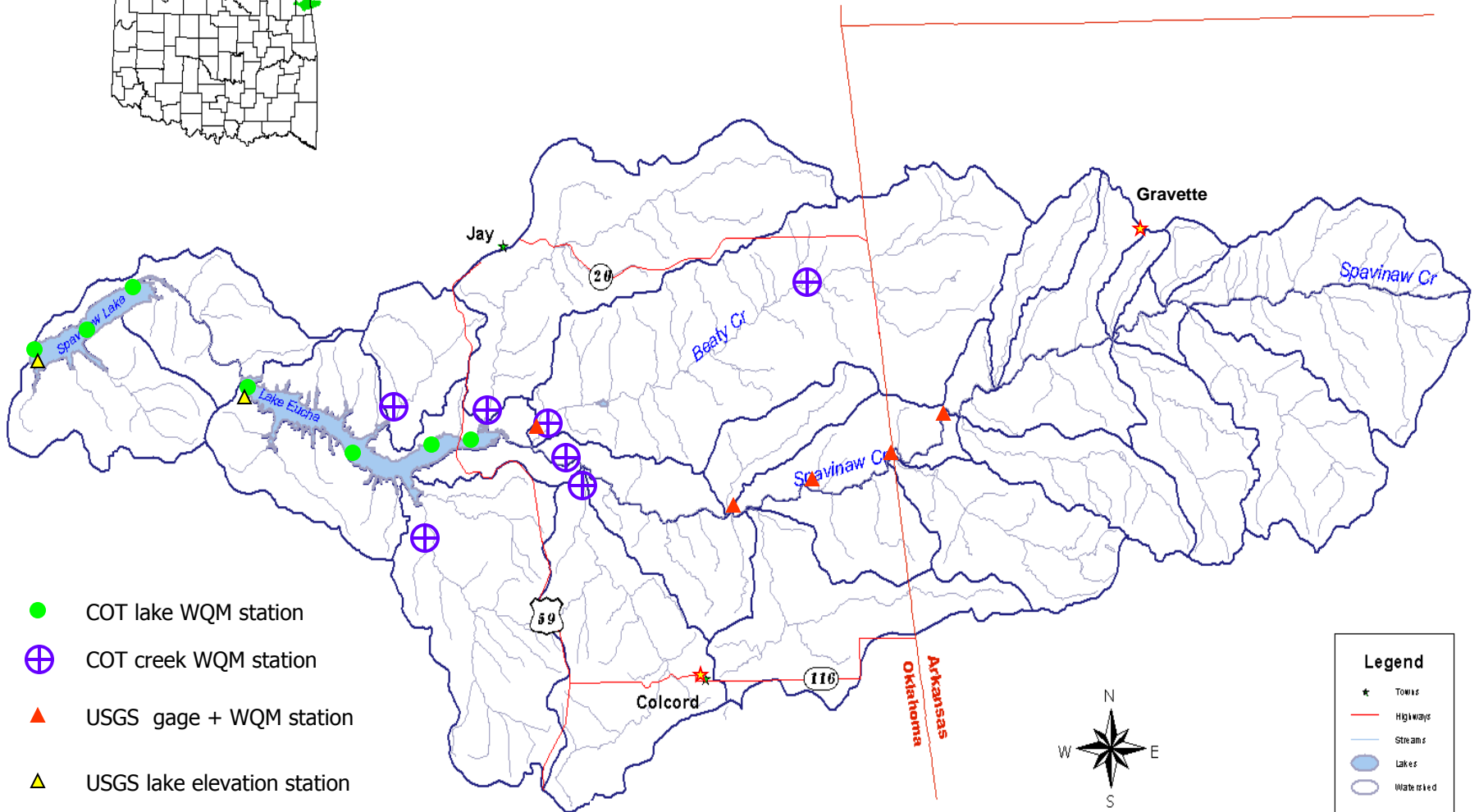
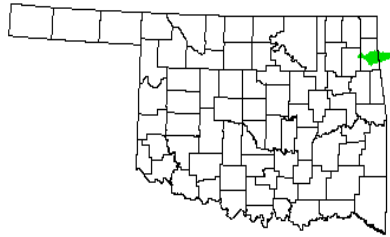


Disposal of agricultural animal waste

=

Huge environmental problem

# Eucha/Spavinaw Watershed

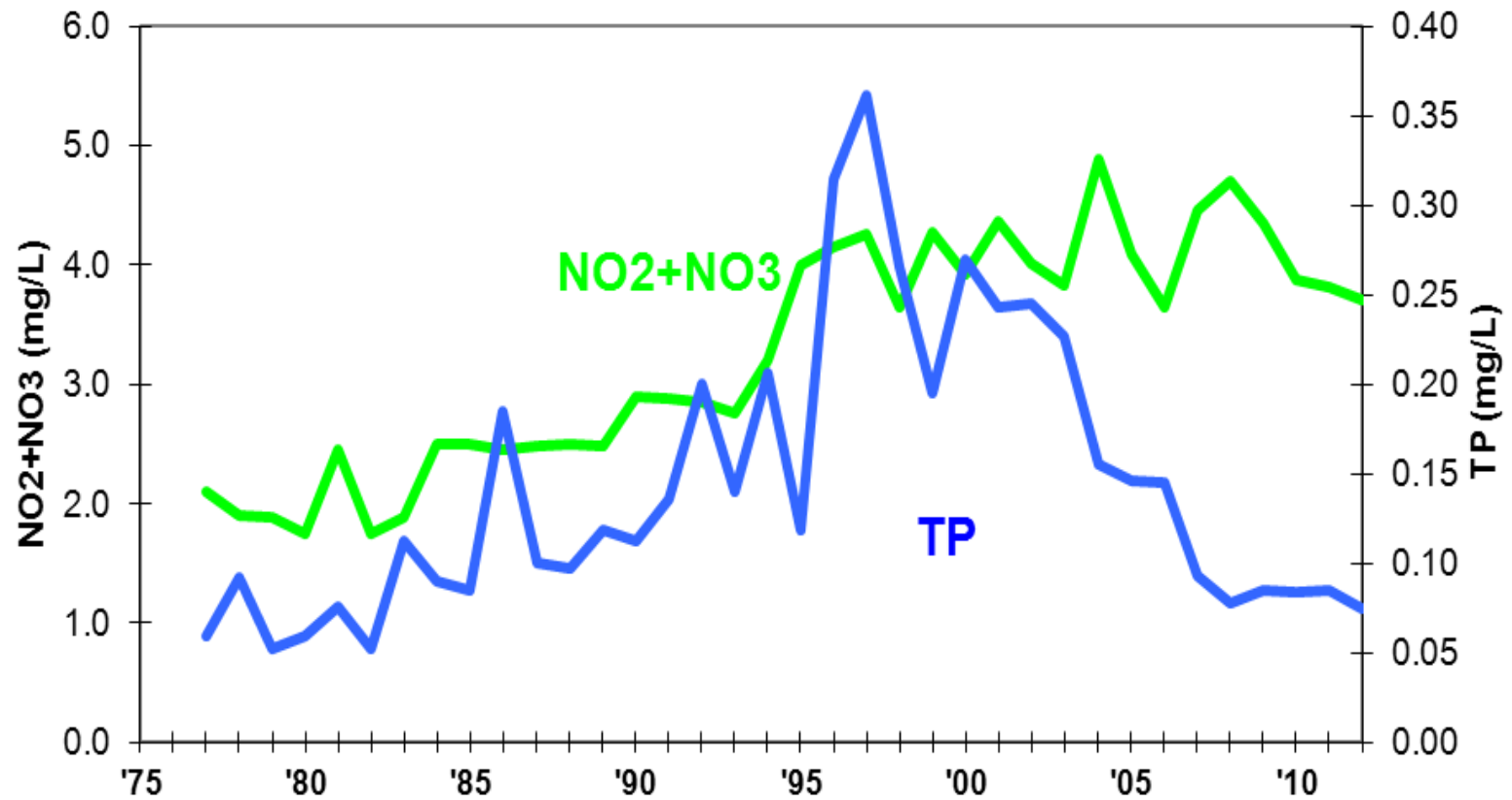


0 2 4 Miles



# Spavinaw Creek at OK-AR Stateline

## N & P Levels



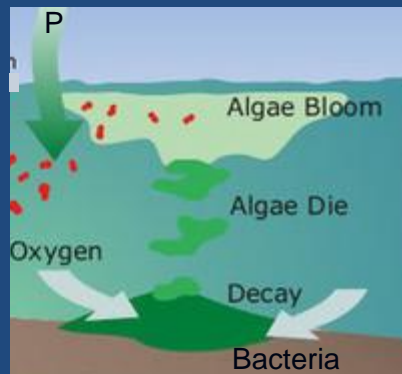
Farmers dispose of poultry waste as a pastureland fertilizer

It rains



Poultry waste-leached and/or runoff rainwater moves poultry waste –derived N & P along watershed to lakes + Point source from MWWTF (>90% Poultry PP)

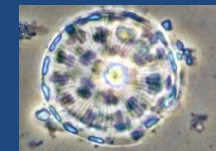
Excess P creates excess algae growth (eutrophication)



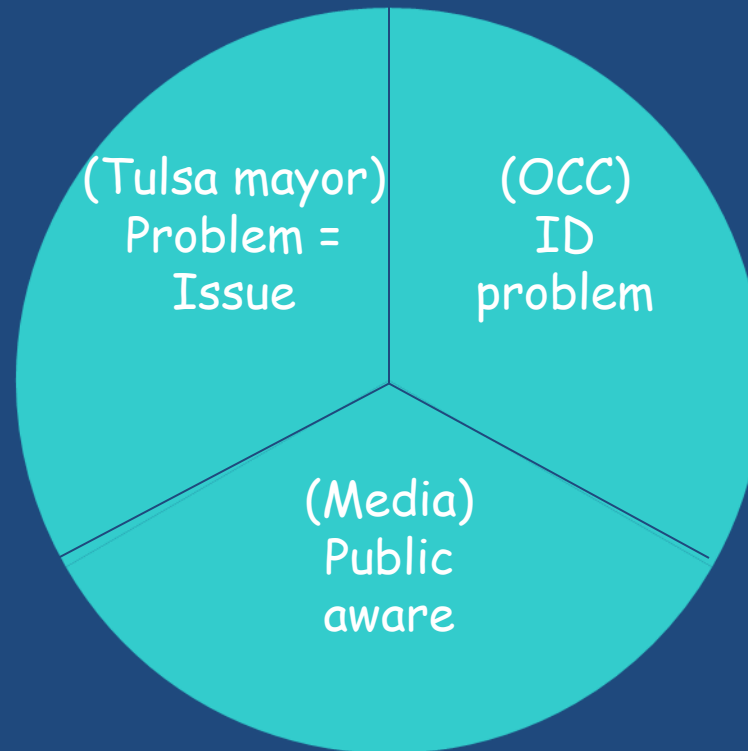
Algae die and decompose, the process consumes oxygen

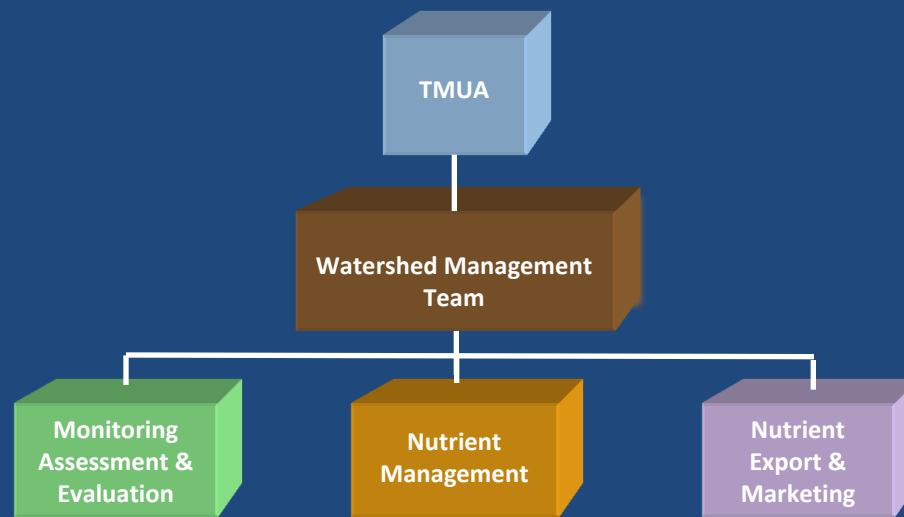
Oxygen levels drop and aquatic life stresses or dies

Excessive algae growth create T&O problems



# 3 things happened to start things...





- Characterize nature & dynamics of WQ impairments

USEPA-approvable QAPP

- Interactive GIS

- Poultry litter export hot-line

- Quantified nutrient loadings

Identifying potential mitigation strategies

Studies



Measures to reduce P loadings would require significant financial support

+

Support from poultry corporations was essential



# Solutions....



- Conservation easements (LL, USFWS, COT)
- Nutrient management
  - On-farm BMPs (OCC, NRCS: NMPs, off-stream water facilities, riparian fencing)
- Nutrient export
  - TMUA, poultry integrators: ship poultry waste back to source area of poultry feed
- Nutrient interception (floating wetlands; passive re-route/P ppt)
- Monitoring and Assessment (OCC, USGS, OWRB, OSU, City of Tulsa)
- Education / Public Outreach
  - schools, water quality events

Sometimes nonprivate entities, etc.  
can create environmental problems...

Lake Maintenance Supervisor



Lake shoreline vegetation destruction

Environmental Lake Supervisor



Water Quality Specialist (me)



Explain that lakes need roughness

Policy (aka "safety net")  
(lake area environmental management procedures)



Higher management  
(fr different rank and professional "silos")



Approves policy

Increasing chances



Are there opportunities for lateral thinking  
at large entities with existing procedures ?

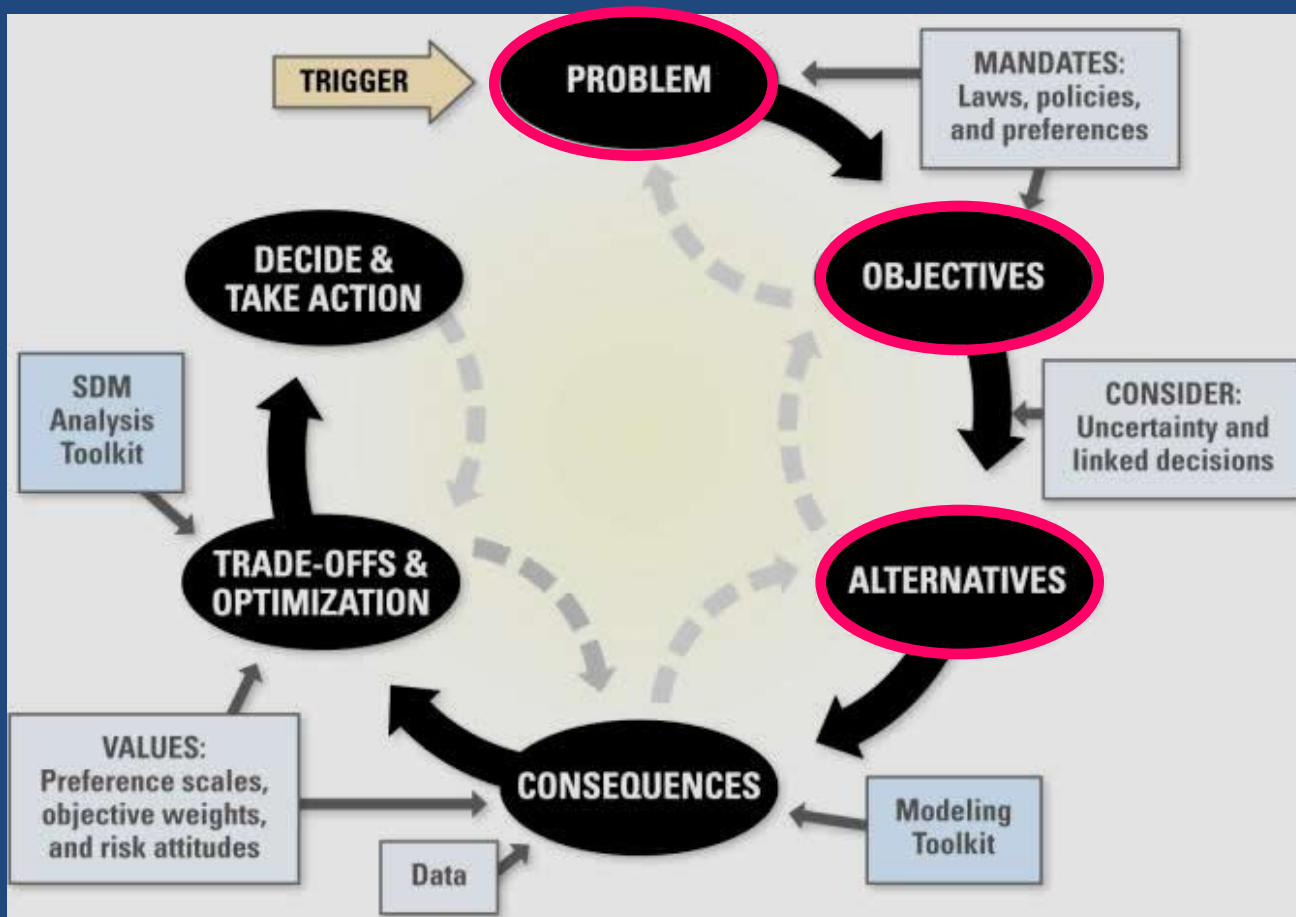




# USFWS's

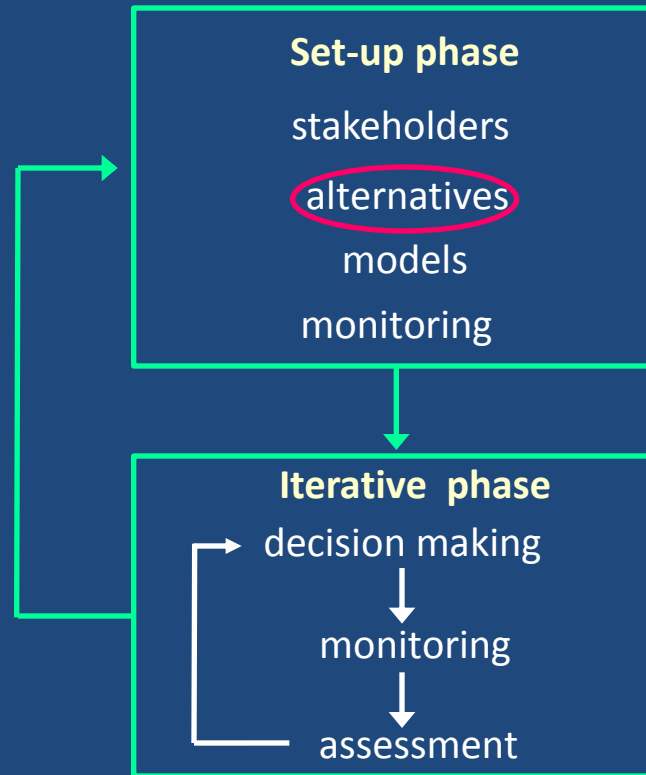


## Structured Decision Making Process (SDS)



Yes !

# Adaptive Management



# Summary

Increase your chances for lateral thinking to occur by “breakingdown silos” and reading outside your field.



Search for ways to look at things differently

Elimination of rigid control of thinking

The use of chance

# For More Information



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