Development of Water Quality Standards for Willard Spur

Measures of Condition

Willard Spur Science Panel

April 5, 2012

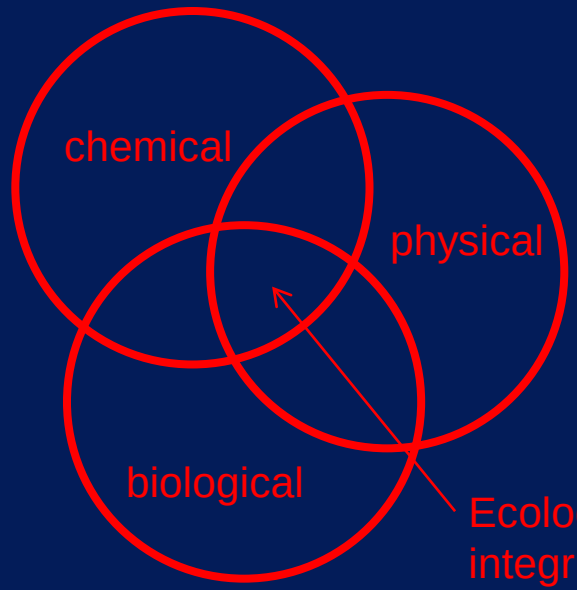
What water quality standards are fully protective of beneficial uses of Willard Spur waters as they relate to the proposed POTW?

What are the potential impacts of the Perry Willard Regional Wastewater Treatment Plant on Willard Spur?

What will be required to provide long term protection of Willard Spur?

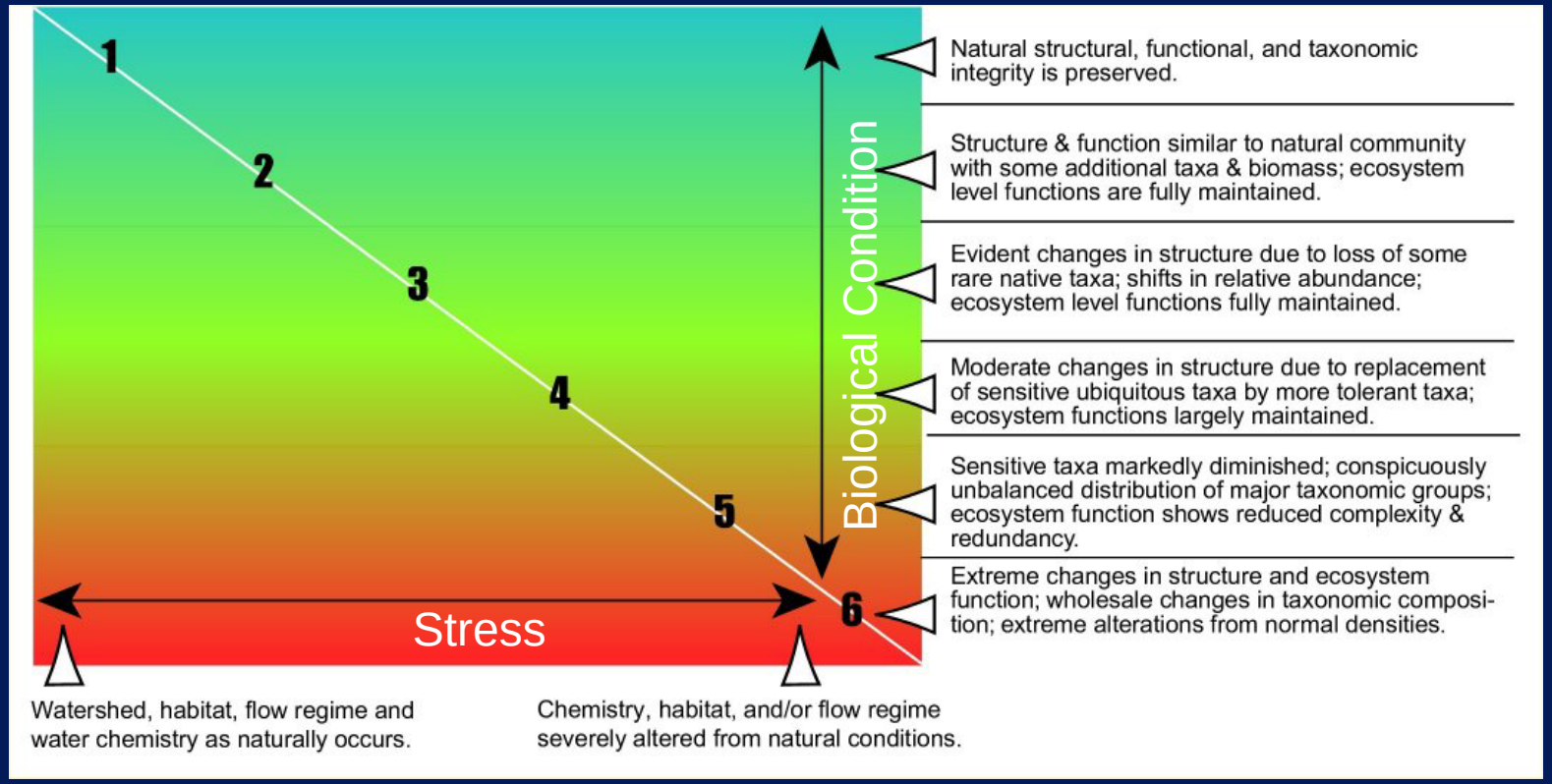
- **Bringing it all together**
  - What do we need to accomplish to get there? Are we on track?
- **The central goal of the Federal Clean Water Act is…**

  "to maintain and restore the chemical, physical, and biological integrity of the Nation's Waters"



- **Measures of biological condition are useful because they:**
  - directly measure beneficial uses,
  - can simultaneously measure the effects of multiple pollutants,
  - provide a continuous record of degradation,
  - are cost effective,
  - are of direct interest to the public, and
  - measure the effects of both point- and nonpoint-source pollutants.

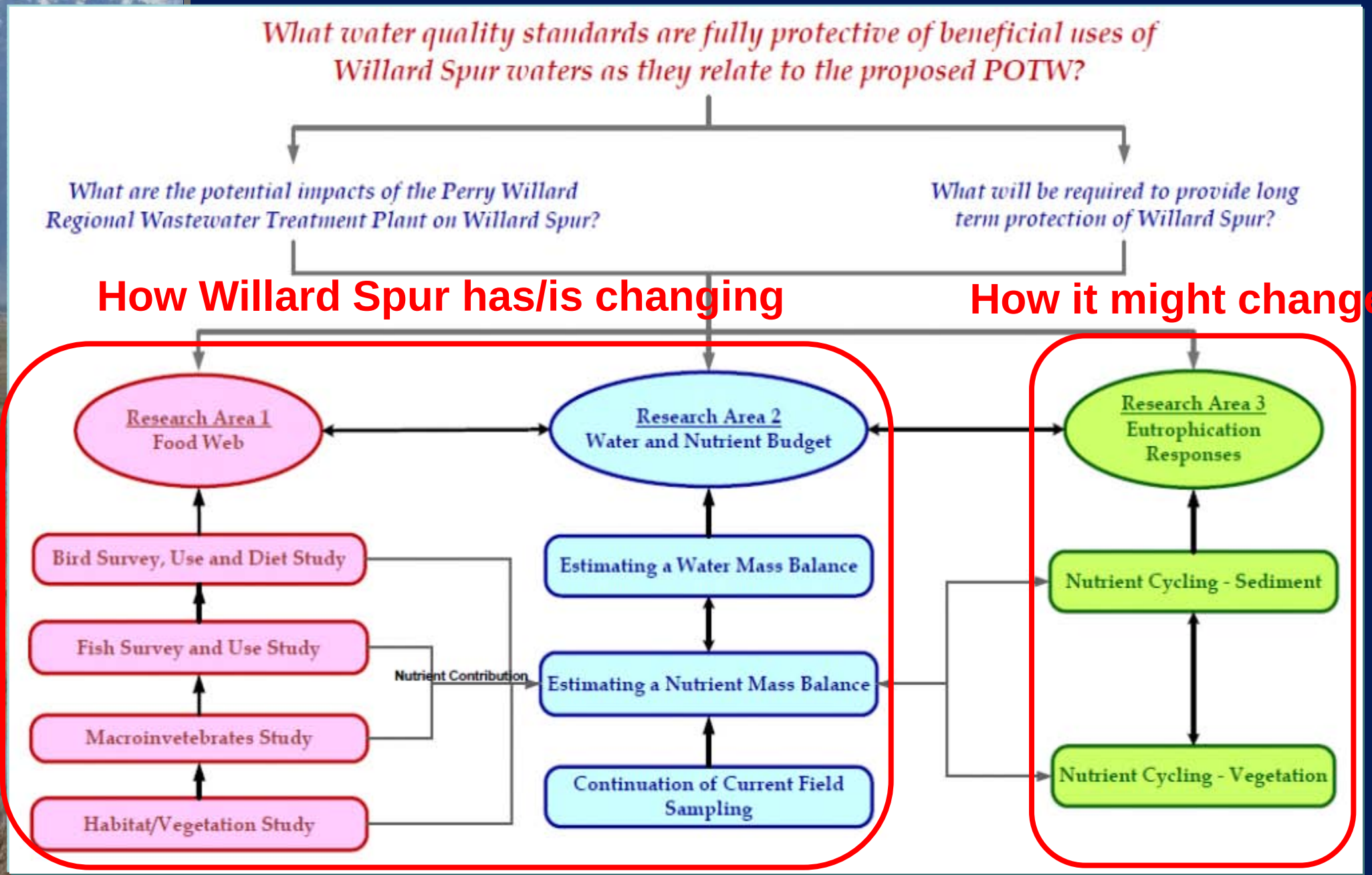
Biological condition decreases with increasing stress



From USEPA, 2005

How do we evaluate the condition, i.e., integrity, of Willard Spur?

- **Much hinges upon cause & effect**
  - What is natural variation vs. a deleterious impact?
  - What role do nutrients play in these effects?
  - How do other factors influence nutrient's role?
  - How do we "fully protect the beneficial uses"?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What will be required to provide long term protection of Willard Spur?
How Willard Spur has/is changing
How it might change
Research Area 1
Food Web
Research Area 2
Water and Nutrient Budget
Research Area 3
Eutrophication Responses
Bird Survey, Use and Diet Study
Fish Survey and Use Study
Macroinvetebrates Study
Habitat/Vegetation Study
Nutrient Contribution
Estimating a Water Mass Balance
Estimating a Nutrient Mass Balance
Continuation of Current Field Sampling
Nutrient Cycling - Sediment
Nutrient Cycling - Vegetation

- **Discussion**
  - What do we need to accomplish to get there? Are we on track?

1. Can we isolate the POTW's impact and perhaps take that off the table? How?

2. How can we fully protect the beneficial uses of Willard Spur into the future?

POTW impacts

- **Nutrient load vs. assimilative capacity**
  - Assimilative capacity of outfall ditch/tailrace
    - *What really reaches Willard Spur?*
  - Assimilative capacity of Willard Spur
    - *Do the POTW's nutrients have a deleterious impact on beneficial uses?*

Nutrient Uptake Capacity

- **Hypothesis:**
  - the Willard Bay tailrace may be transforming and retaining nutrients thus minimizing export into Willard Spur

Nutrient Uptake Capacity

- **Suggested approach:**
  - Pulse addition method to quantify inorganic N transport and removal (per Tank et al. 2008 and Covino et al. 2010)

Nutrient Uptake Capacity

- **Pulse Addition Approach**
  - Preliminary release of conservative tracer (NaCl) to measure travel time, dispersion, mixing
  - Add conservative tracer plus ammonium or nitrate
  - Collect water samples at fixed intervals to characterize the peak as it passes by each station
  - Calculate biotic demand relative to concentration using mass balance approach (N vs tracer)