



# **Delta & Aqueduct Taste & Odor Precursors: Modeling Status**

**Analysis Framework**

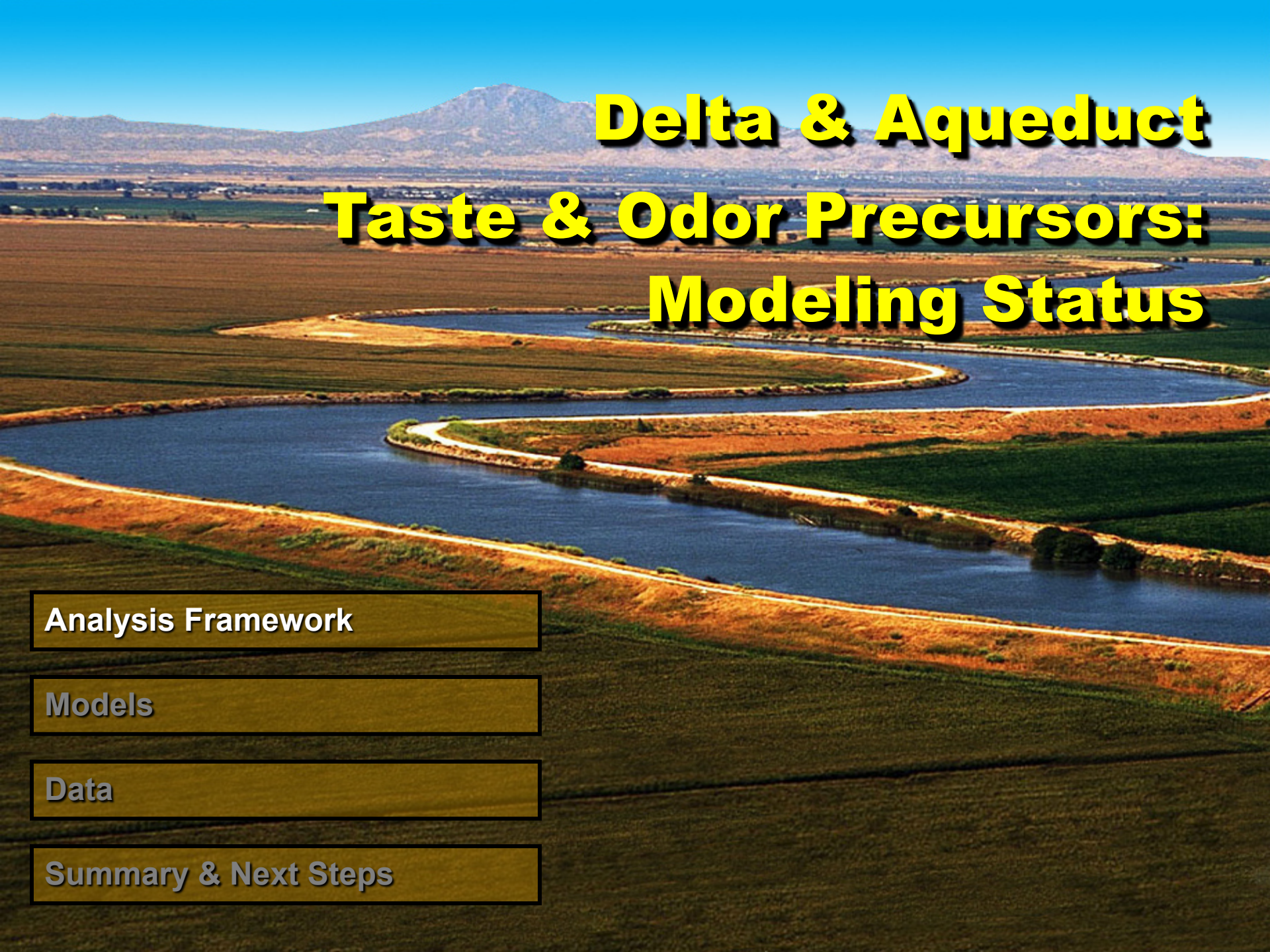
**Models**

**Data**

**Summary & Next Steps**

**Paul Hutton  
Metropolitan Water District  
CWEMF Technical Workshop  
March 2008**



An aerial photograph of a large-scale water infrastructure project. A long, winding aqueduct, constructed from reddish-brown earth, snakes through a dry, brownish landscape. The aqueduct is filled with dark blue water. The surrounding land is a mix of dry grass and patches of green. In the far distance, a range of mountains is visible under a clear blue sky.

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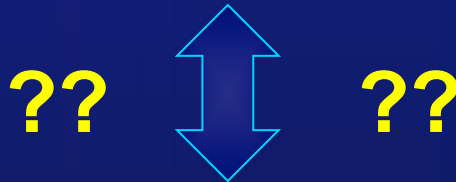


# Taste & Odor Precursors

Nutrient Loading



Nutrient Fate & Transport

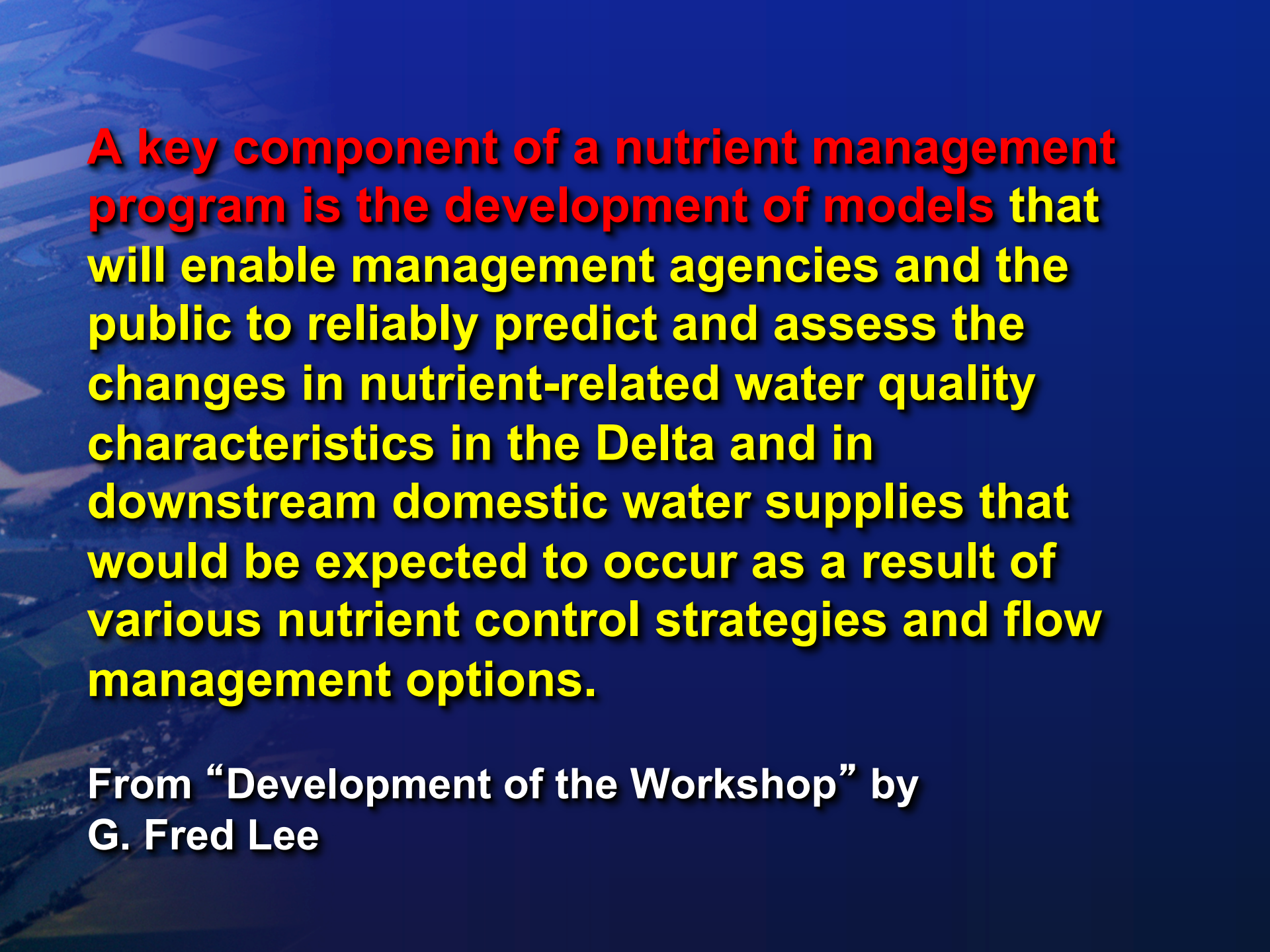


Ecological Response  
(Chlorophyll)



Taste & Odor Events

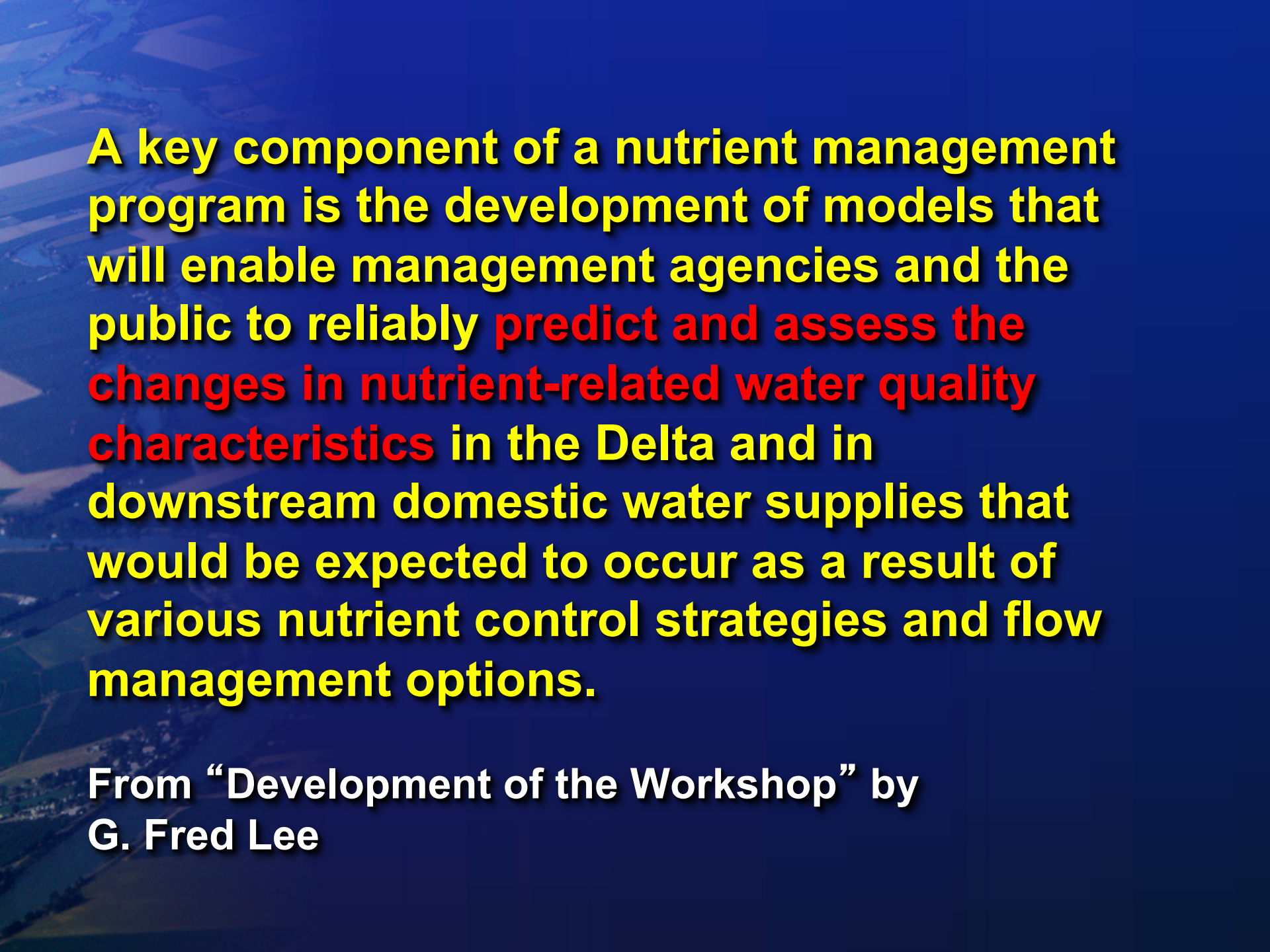




**A key component of a nutrient management program is the development of models that will enable management agencies and the public to reliably predict and assess the changes in nutrient-related water quality characteristics in the Delta and in downstream domestic water supplies that would be expected to occur as a result of various nutrient control strategies and flow management options.**

**From “Development of the Workshop” by  
G. Fred Lee**

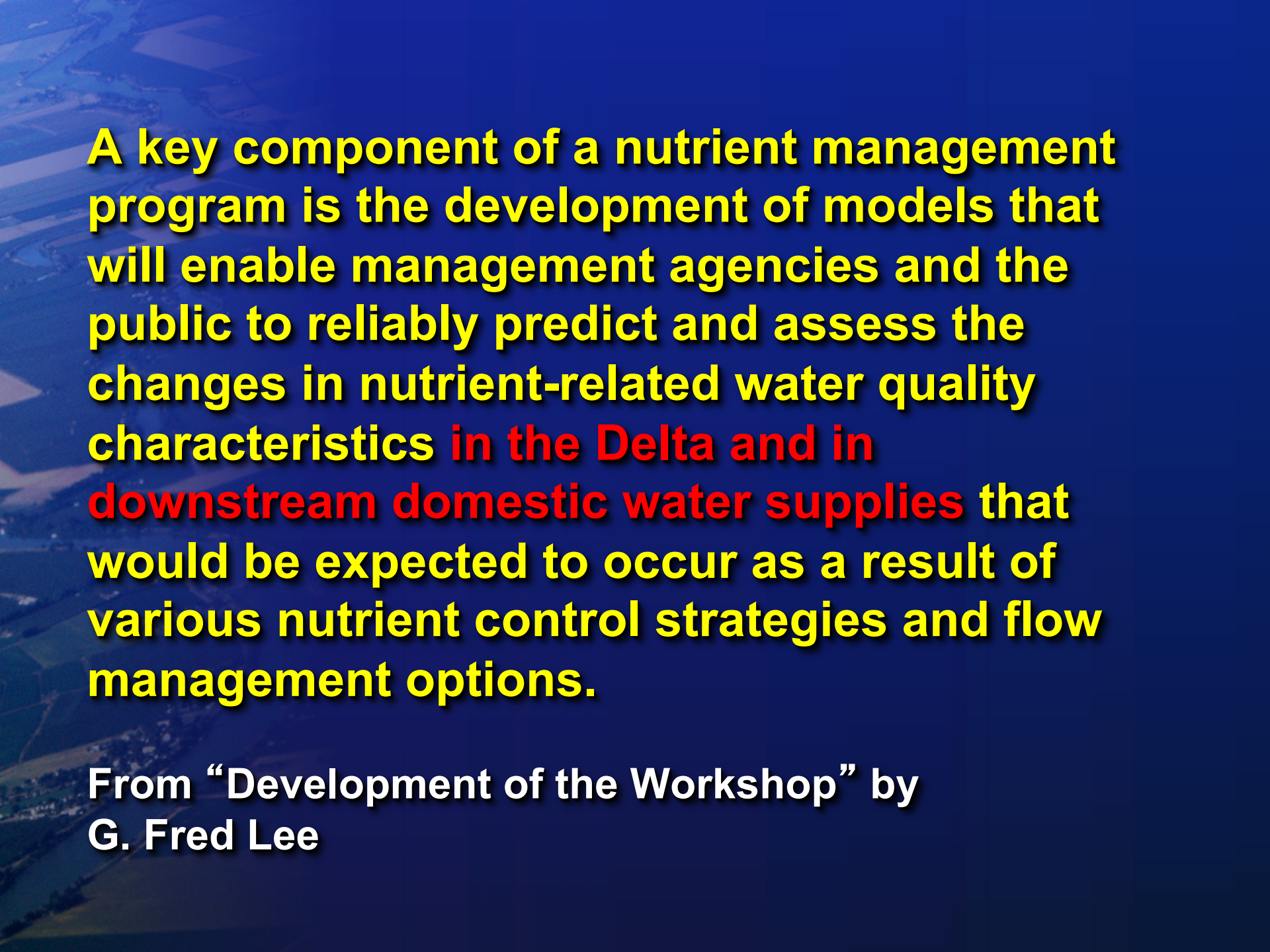




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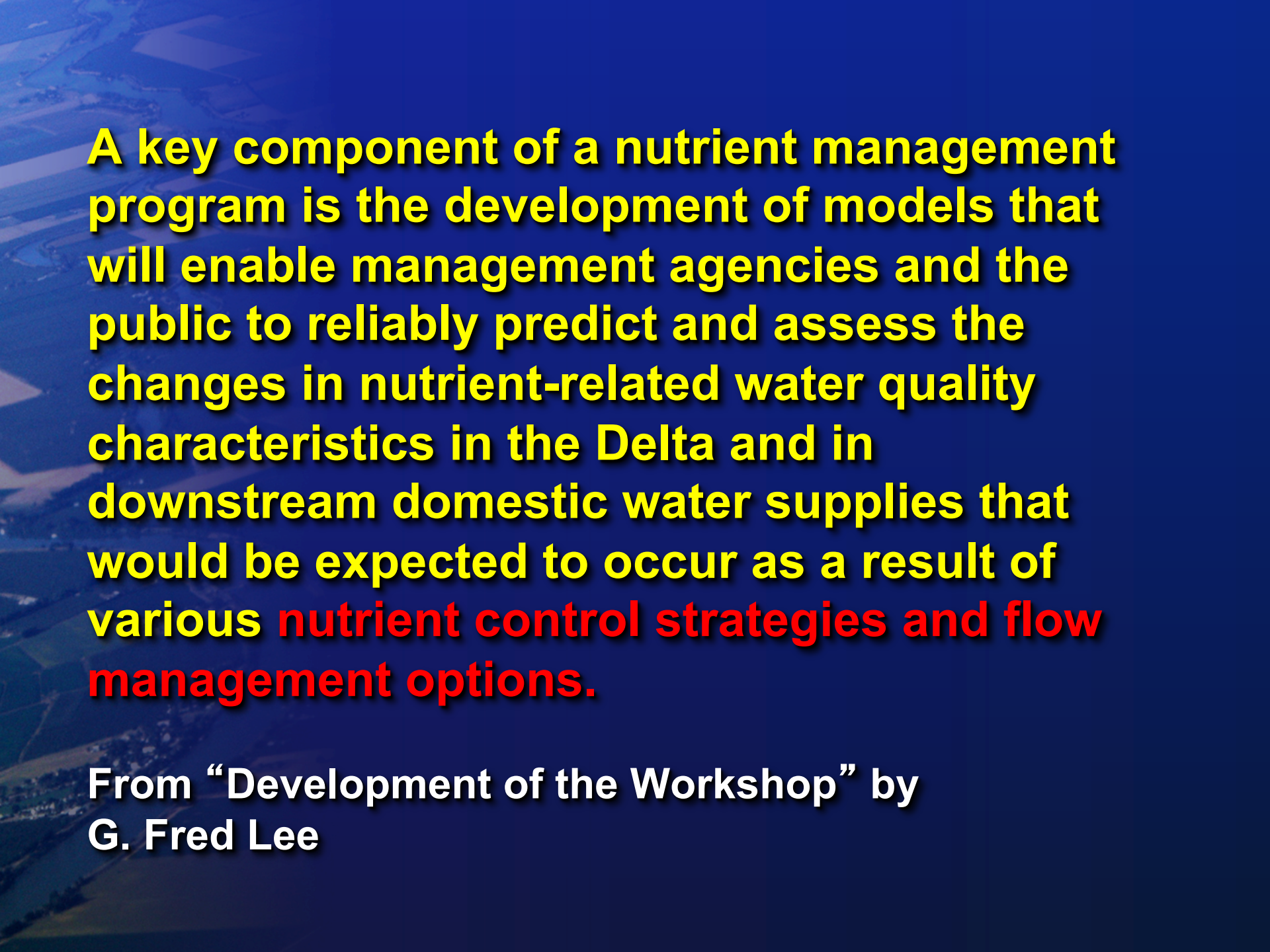




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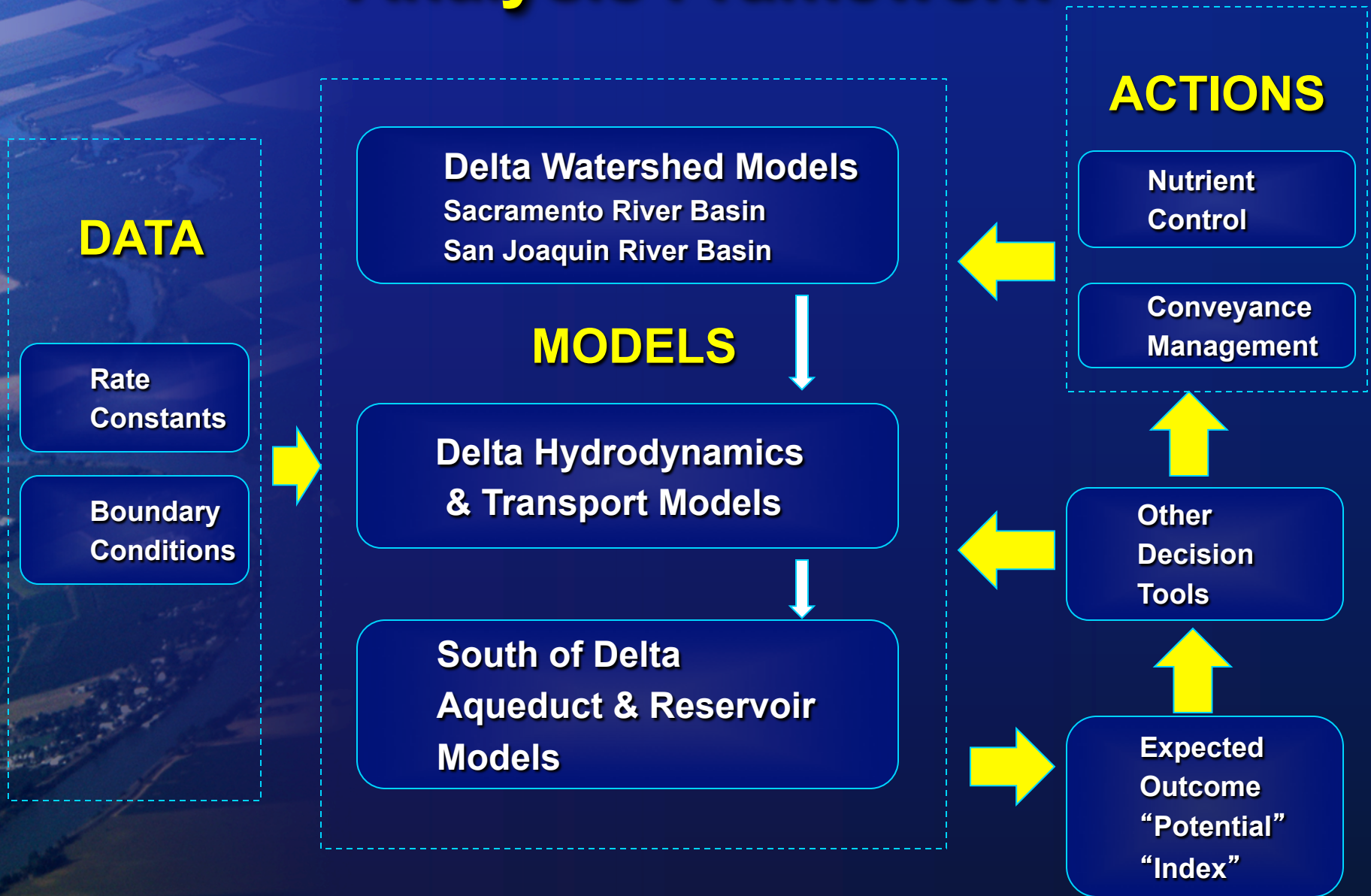


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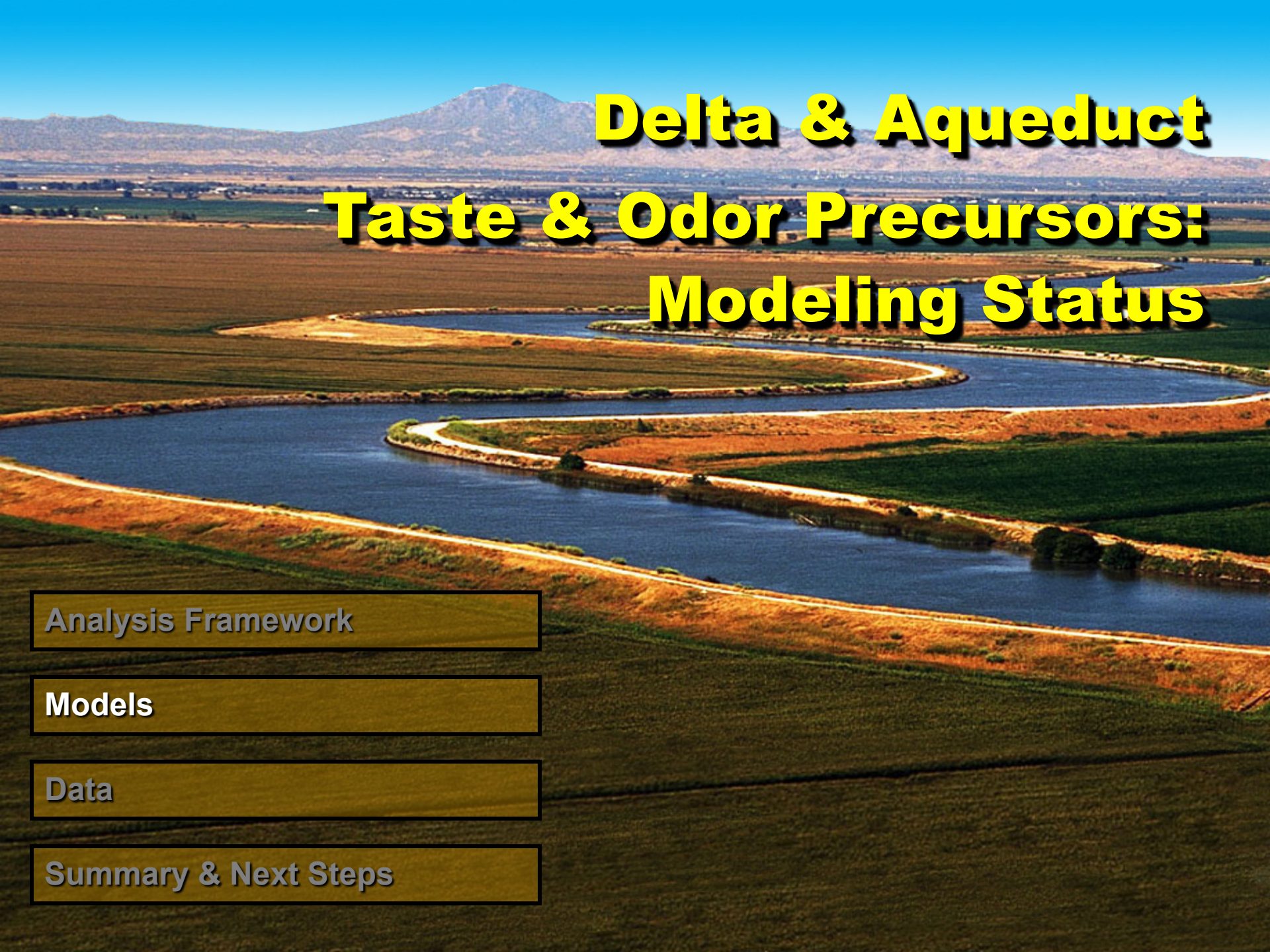
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# Analysis Framework





An aerial photograph of a large-scale water infrastructure project. A long, winding aqueduct, constructed from reddish-brown earth, snakes through a dry, brownish-green landscape. The aqueduct is filled with dark blue water. In the background, a range of mountains is visible under a clear blue sky. The title text is overlaid on the upper right portion of the image.

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Model	Licensor			
		Delta Watersheds	Delta	South of Delta
DSM2	DWR (Public Domain)	San Joaquin Basin	1-D	California Aqueduct + DMC
WARMF	USEPA (Public Domain)	San Joaquin Basin (mass balance)		
RMA11	RMA		2-D	
MIKE21	DHI		2-D	
Link Node Model	Systec		1-D (limited)	
DYRESM-WQ	Flow Science			Southern California Reservoirs



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# Data Requirements

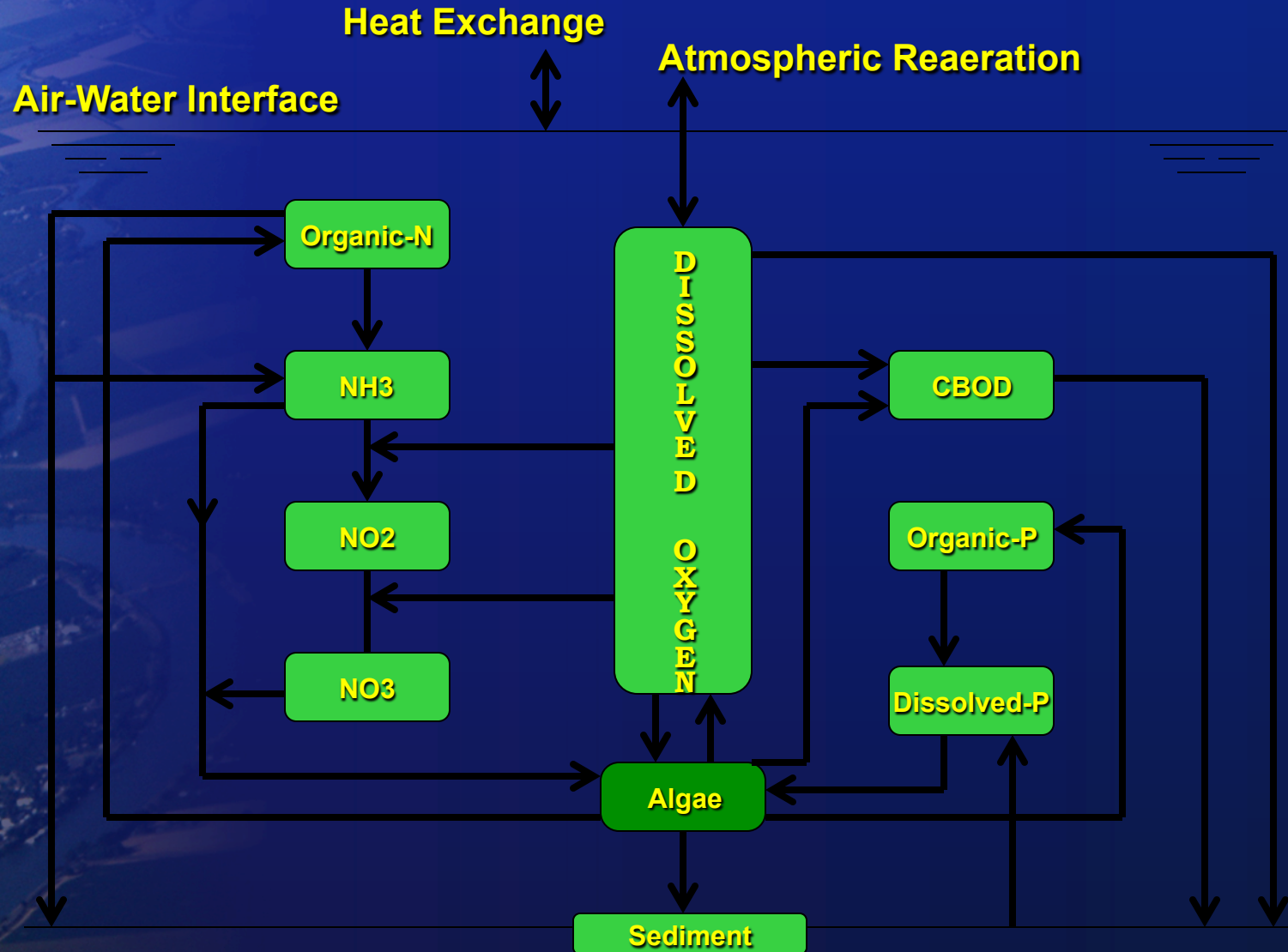
Analysis Type	Rate Constants	Boundary Conditions		Downstream Conditions	
		Flow	Water Quality	Flow	Water Quality
Model Calibration	X	X	X	X	X
Historical Simulation Model Validation		X	X	X	X
Long Term Planning Impact Assessment		X	X		

# Data Requirements

Analysis Type	Rate Constants	Boundary Conditions		Downstream Conditions	
		Flow	Water Quality	Flow	Water Quality
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Historical Simulation Model Validation		X	X	X	X
Long Term Planning Impact Assessment		X	X		
Reconnaissance (Fingerprinting)		X			

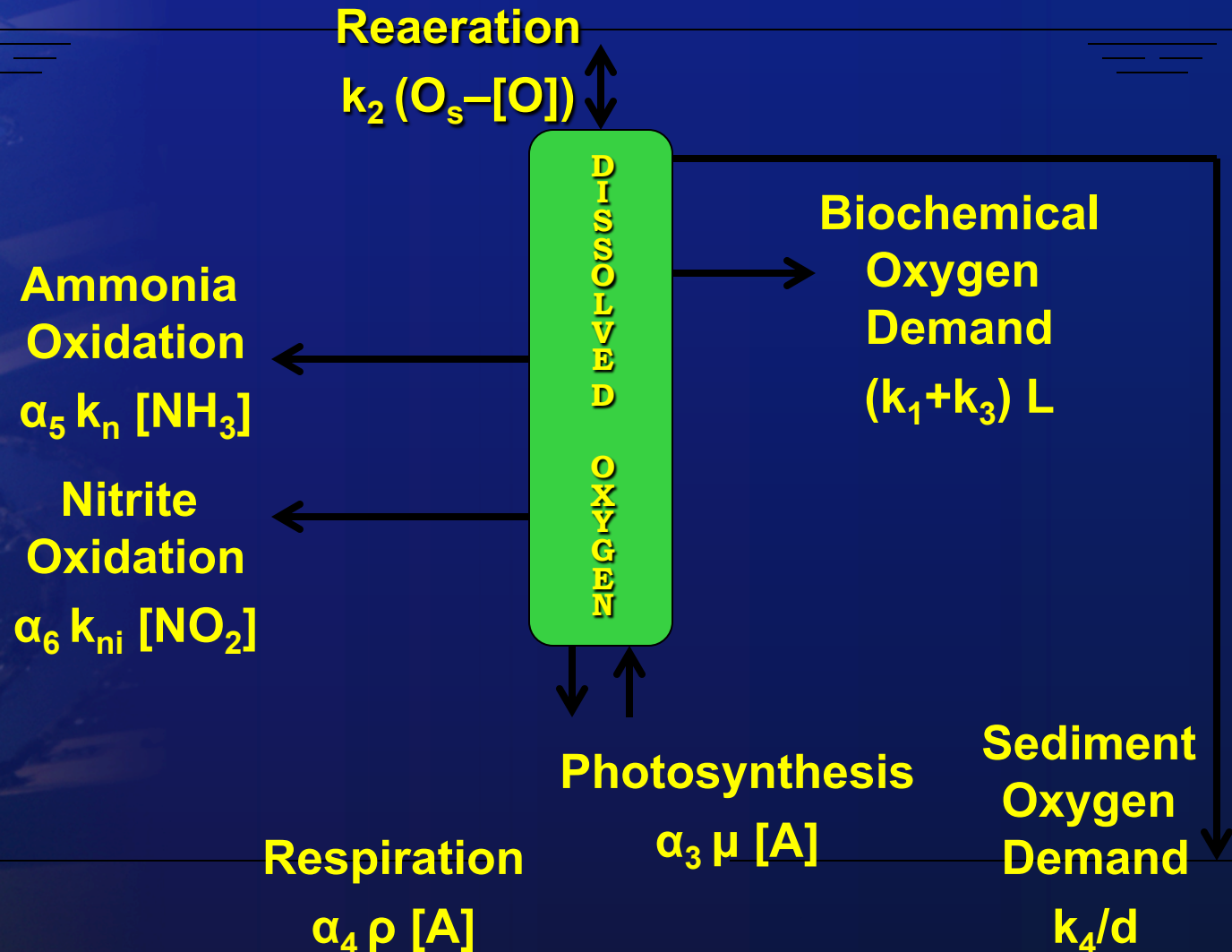


# DO Sources and Sinks



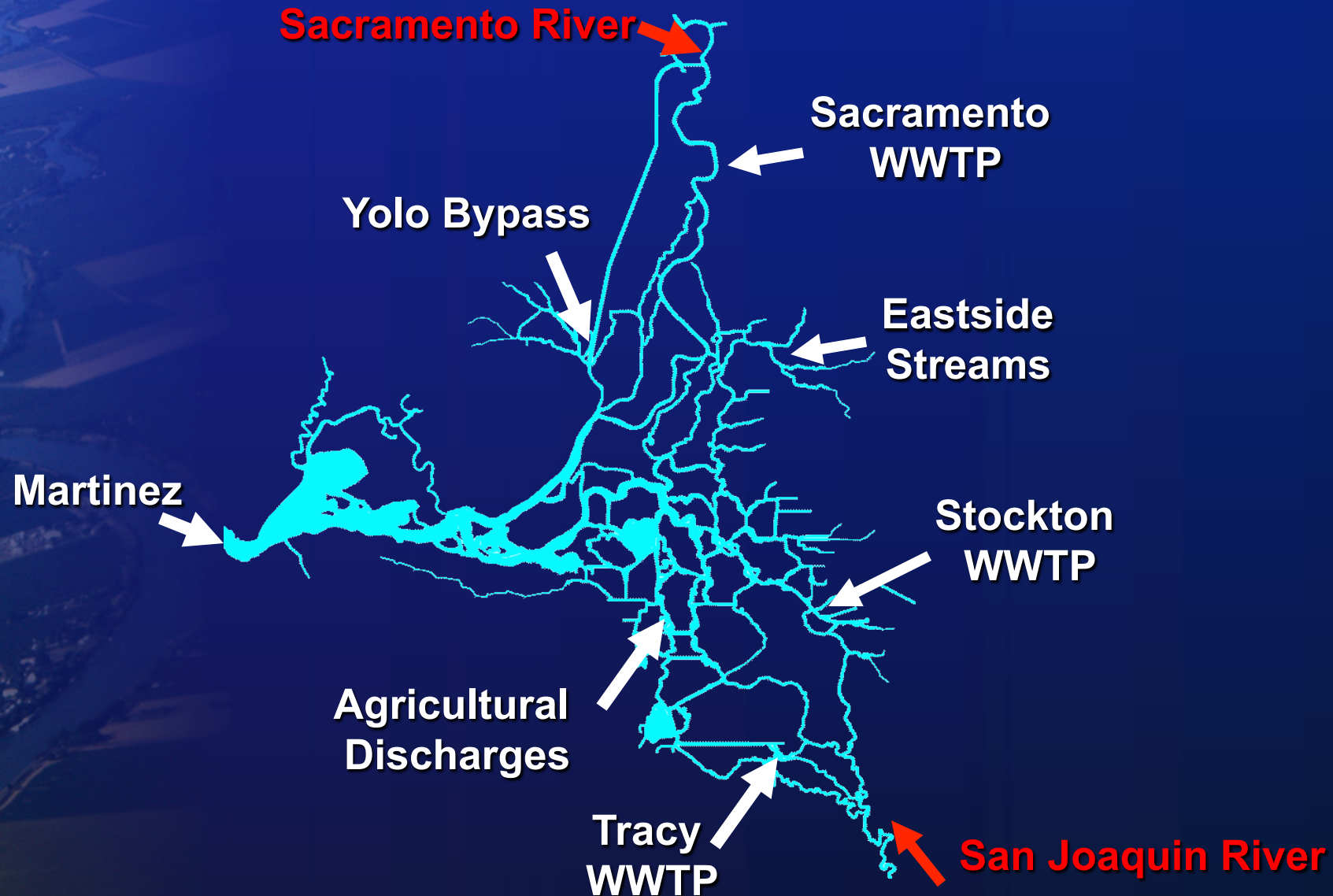
# Example Rate Constants

## Dissolved Oxygen Mass Balance





# Water Quality Boundary Conditions Delta



# Water Quality Boundary Conditions

## Sacramento River Watershed

- Shasta Releases
- Feather River
- American River
- Colusa Basin Drain
- Sacramento Slough
- Natomas East Main Drain
- Others?

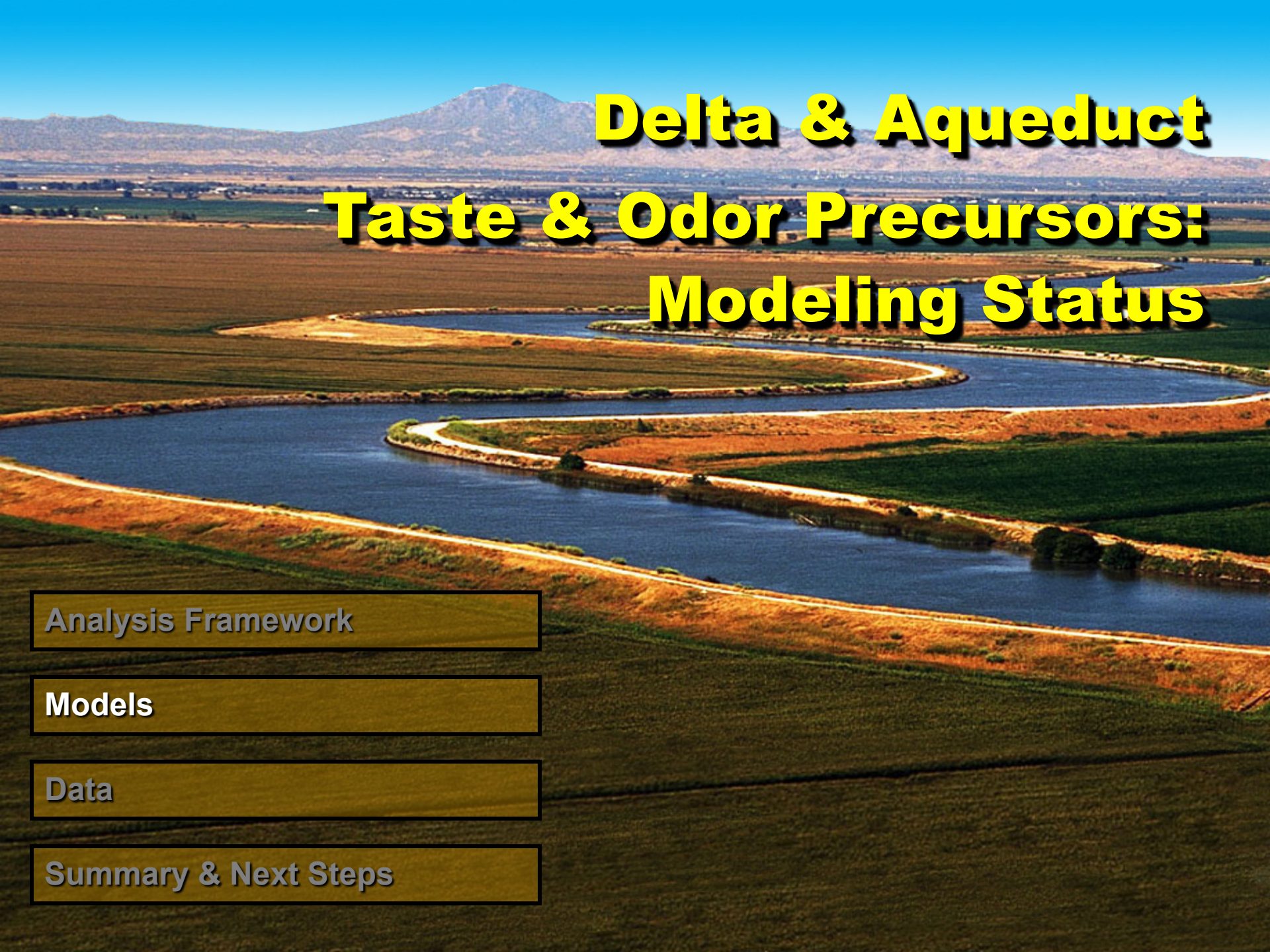
## San Joaquin River Watershed

- SJR @ Lander Ave.
- Mud and Salt Sloughs
- Other West Side Inflows
- Stanislaus River
- Tuolumne River
- Merced River
- Others?

## South of Delta Aqueducts

- Banks Pumping Plant
- Jones Pumping Plant
- Kern River Interie
- Miscellaneous Inflows (e.g. groundwater pump-ins, storm water inflows)



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# Summary

- **Models status**
- **Data status**



# Possible Next Steps

- **Expand focus beyond Stockton DWSC to entire Delta**
- **Identify promising actions through “fingerprint” analysis**
  - **Spatial characteristics**
  - **Temporal characteristics**
- **Conduct a multi-year historical simulation (e.g. model validation)**
  - **Don’t be afraid to be wrong (you will be)**
  - **Identify information gaps**

# Possible Next Steps (cont' d)

- **Fund, design & implement long-term monitoring program**
  - Characterize sources (boundary conditions)
  - Calibrate rate constants
- **Fund long-term model development & maintenance**



An aerial photograph of a river winding through a patchwork of agricultural fields. The fields are in various shades of green and brown, indicating different crops or stages of growth. The river is a light blue color, contrasting with the darker tones of the land. The overall scene is a typical rural landscape.

# **Extra Slides**

# DSM2-Aqueduct Model Schematic

