UNDERSTANDING WATER QUALITY IN A LARGE WATERSHED :
THE CATAWBA WATER QUALITY MASTER PLAN.

October 22, 2019

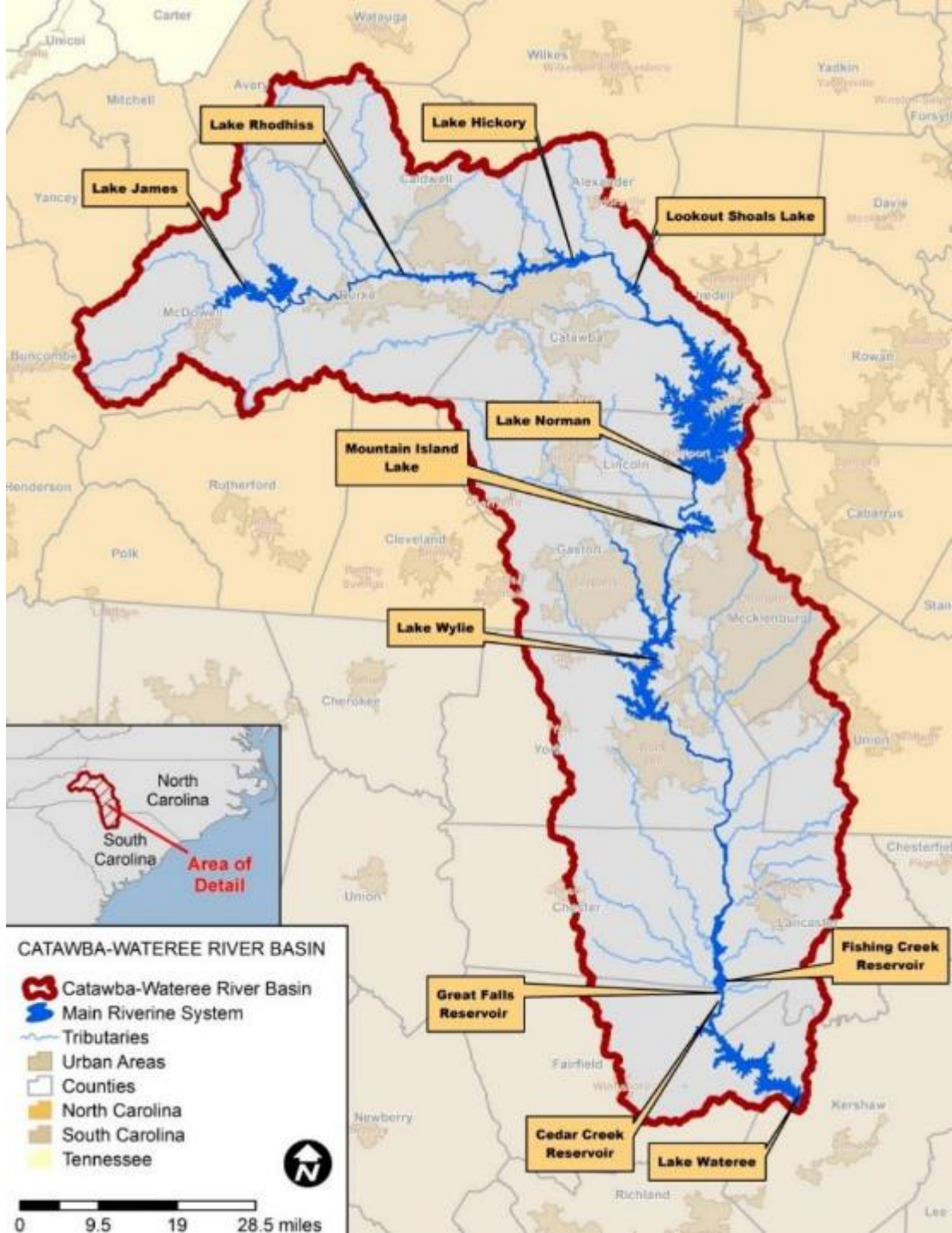
BUILDING A WORLD OF DIFFERENCE®

CATAWBA WATEREE WATER MANAGEMENT GROUP

BLACK & VEATCH

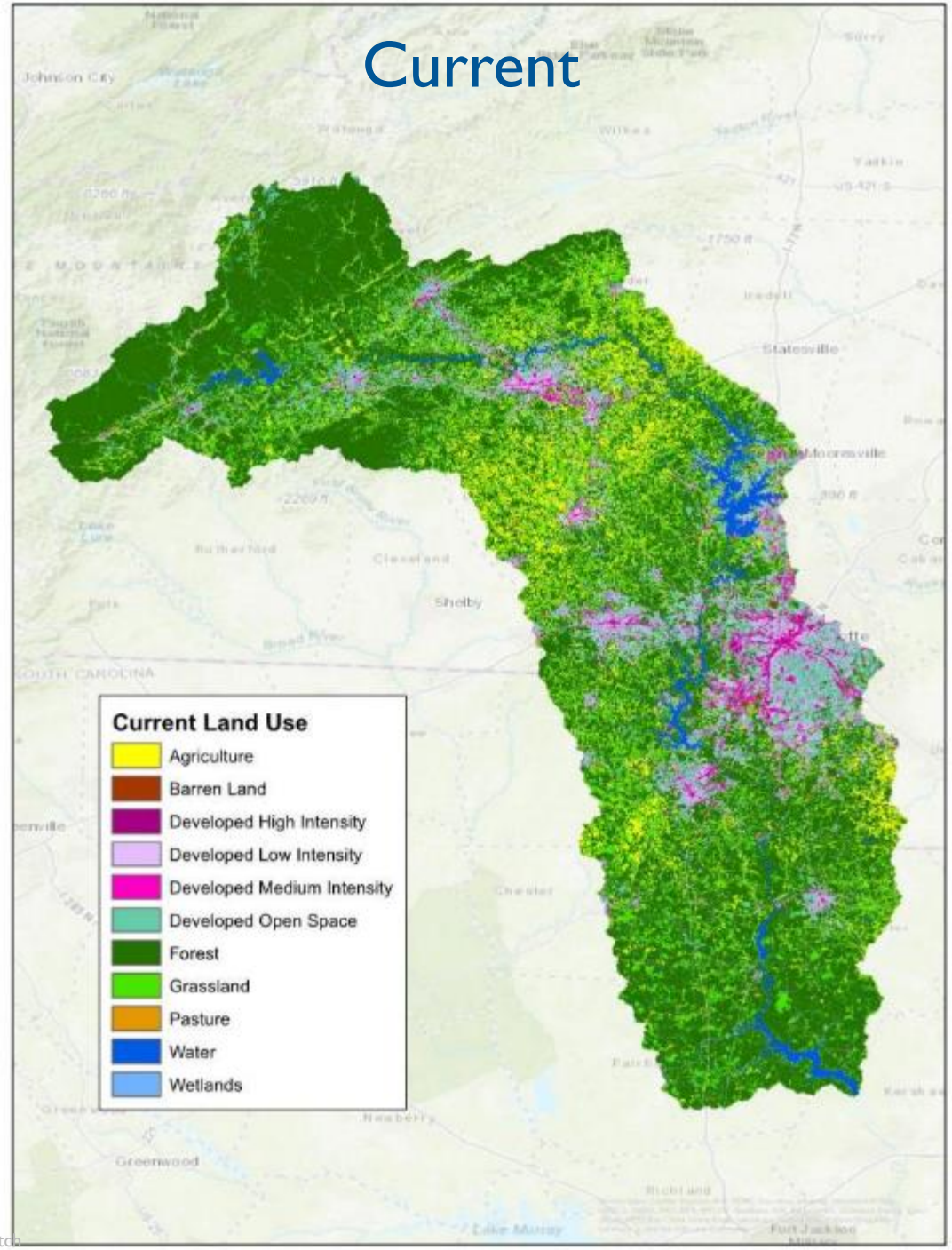
THE BASIN

- 4,750 square miles
- Supports nearly two million people

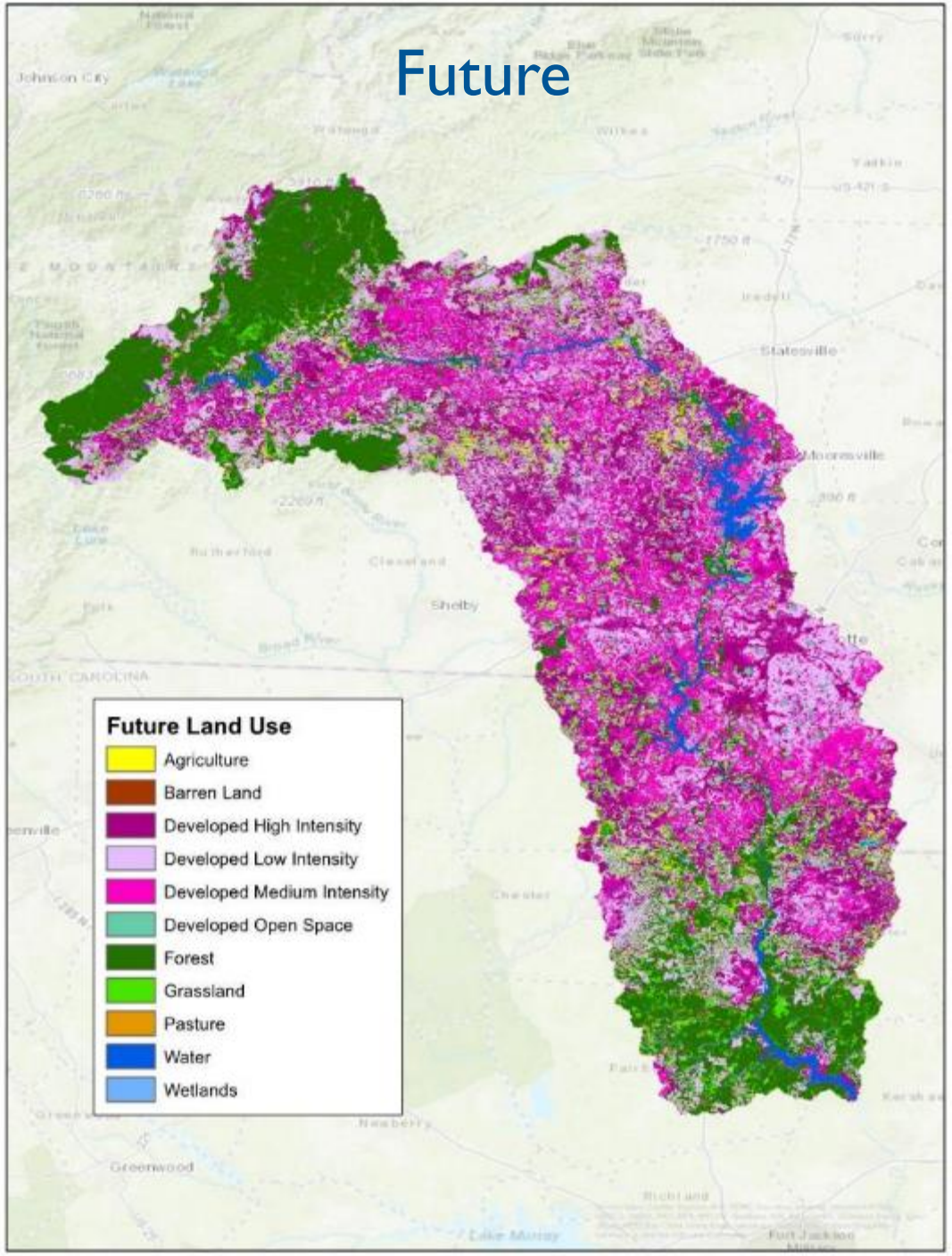


CATAWBA WATEREE
WATER MANAGEMENT GROUP

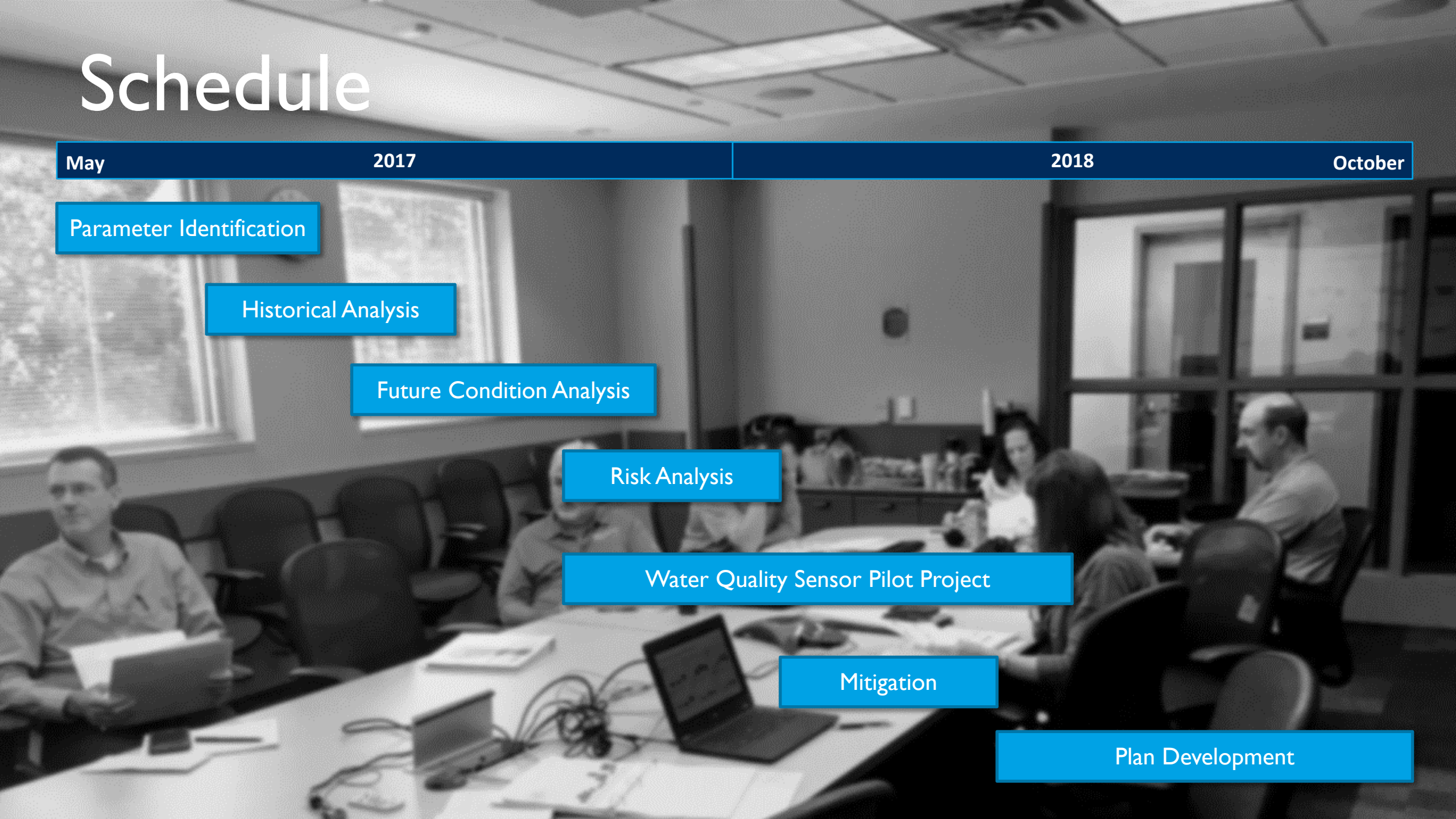
Current

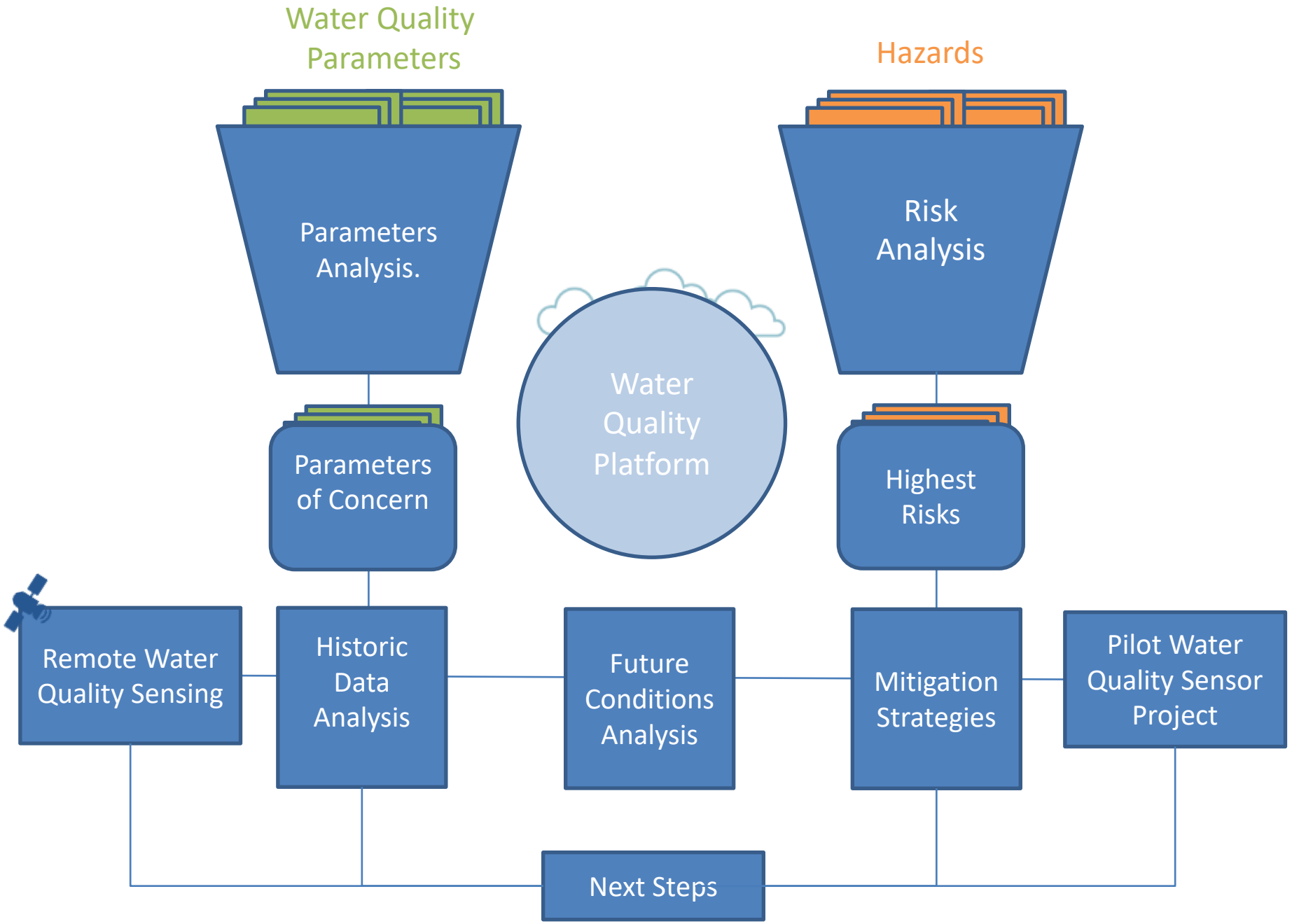


Future

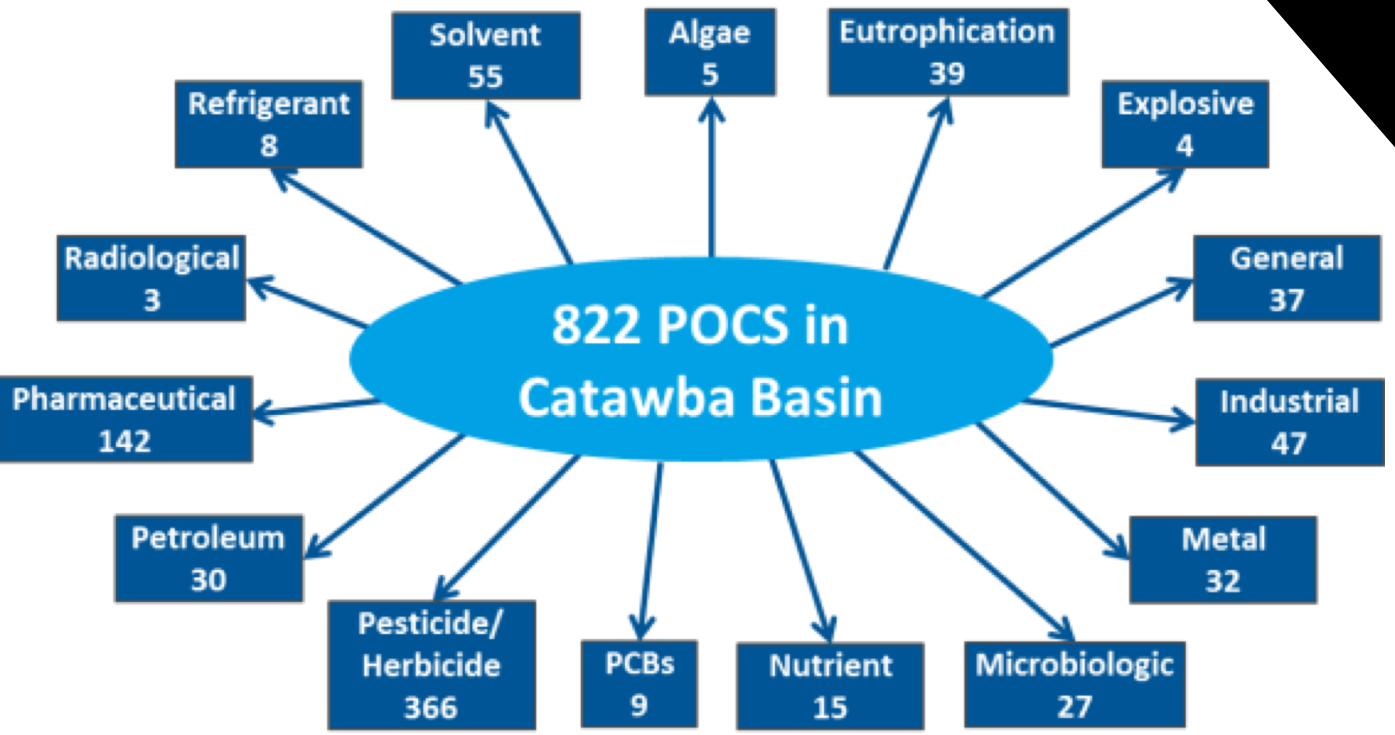


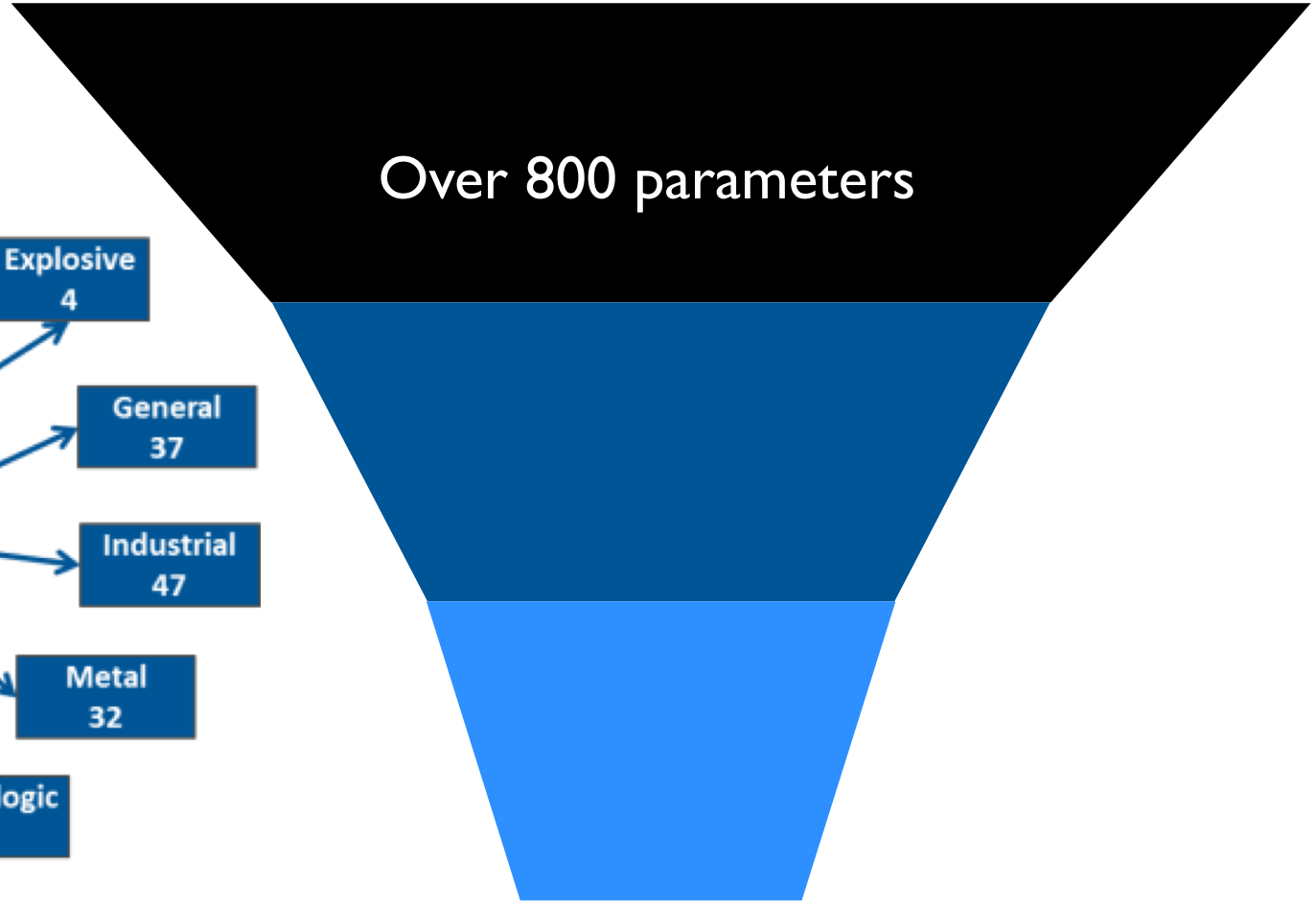
Schedule


May
2017
2018
October
Parameter Identification
Historical Analysis
Future Condition Analysis
Risk Analysis
Water Quality Sensor Pilot Project
Mitigation
Plan Development


Water Quality Parameters
Hazards
Parameters Analysis.
Risk Analysis
Water Quality Platform
Parameters of Concern
Highest Risks
Remote Water Quality Sensing
Historic Data Analysis
Future Conditions Analysis
Mitigation Strategies
Pilot Water Quality Sensor Project
Next Steps

Refining data to examine





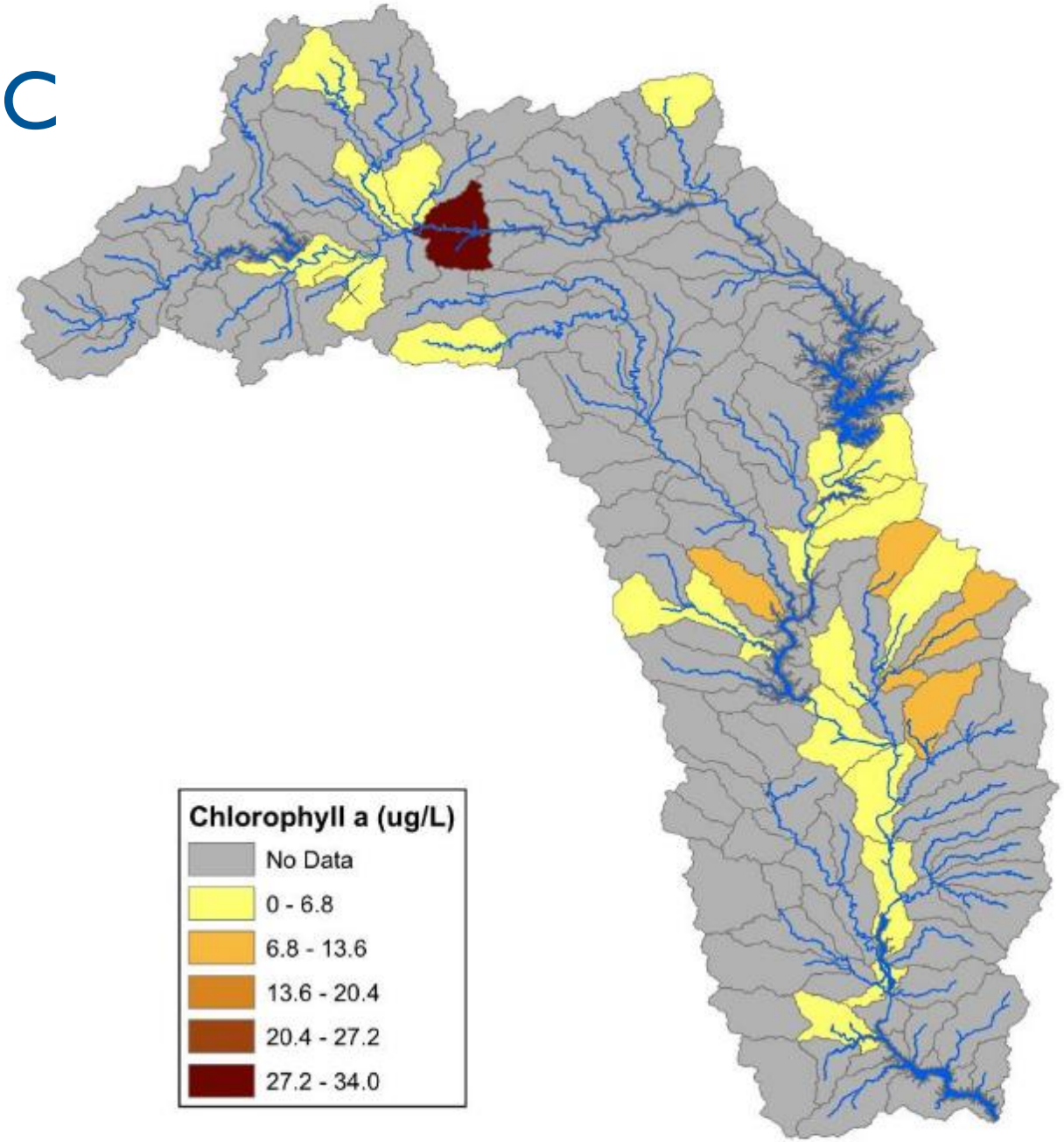
379 Parameters

Parameter of Concern list

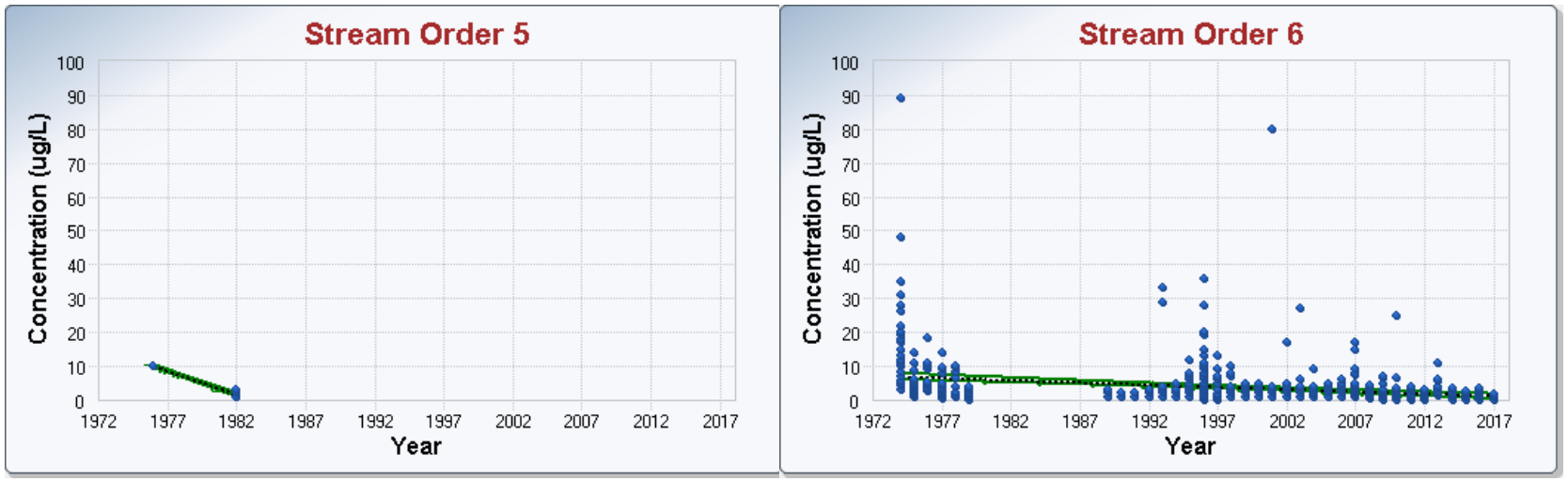
- Developed the POC based on input from committee
- Ranked groups of similar POCs

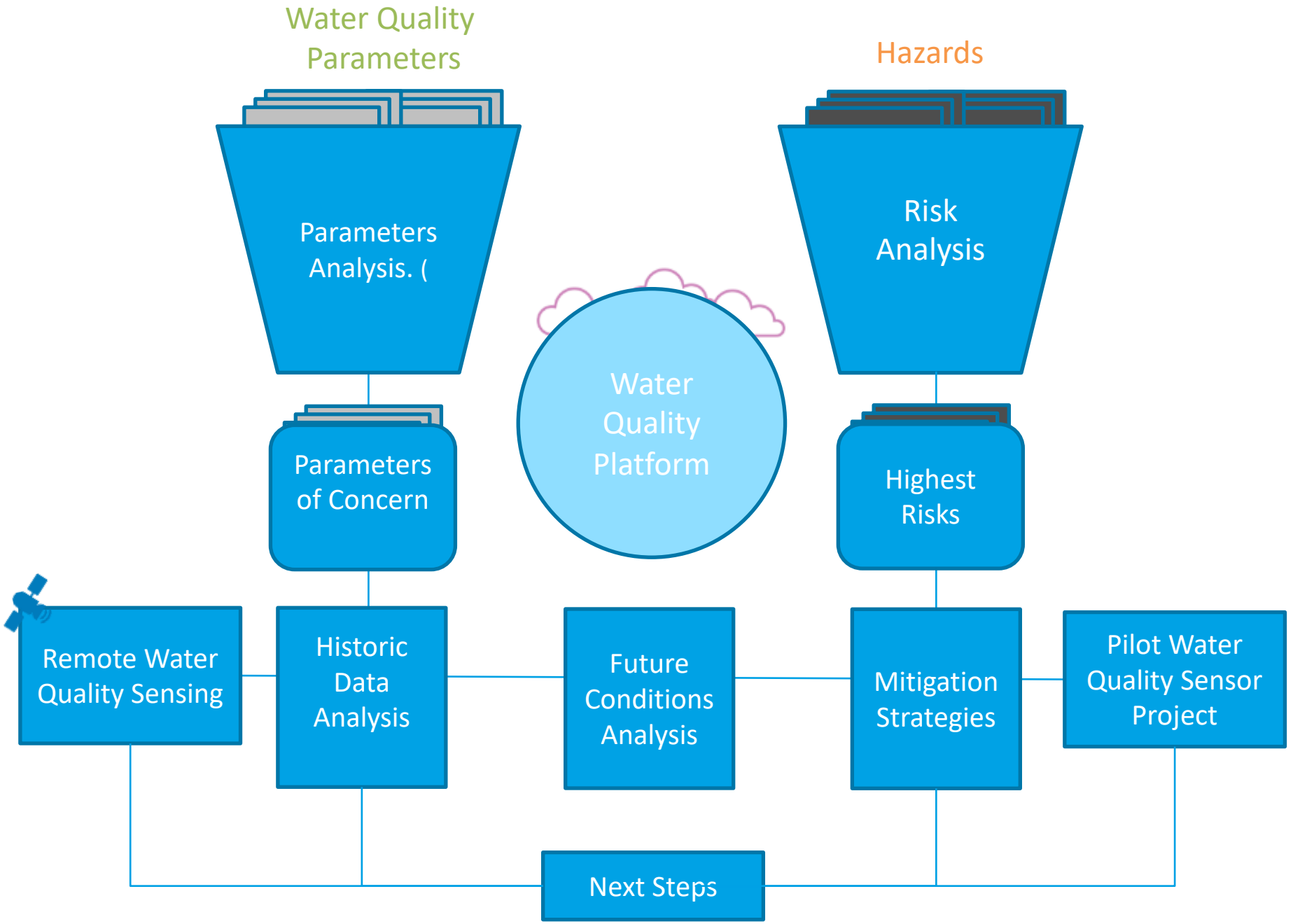
Group Ranking (1 = Most Important to 16 = Least Important)									
Groups	**Initial Ranking**	**Stakeholder Group Ranking**							**Final Ranking**
Eutrophication	1	1	2	1	1	14	1	5	1
Nutrient	2	2	3	3	2	11	6	6	2
Algae	3	3	1	5	8	10	3	4	3
Metal	5	6	6	2	3	5	8	7	4
Microbiologic	4	4	4	4	10	8	5	3	5
DisinfectionByproduct	11	9	5	9	12	1	2	1	6
General	7	5	8	12	13	9	7	2	7
PesticideHerbicide	10	8	13	8	15	2	4	12	8
WaterClarity	6	7	7	6	9	15	13	8	9
Solvent	9	10	11	7	14	4	10	11	10
Industrial	13	14	9	13	6	3	12	9	10
Petroleum	8	12	10	10	11	6	11	10	12
PCBs	12	11	16	11	5	7	9	13	13
Pharma	14	13	12	14	4	13	14	15	14
Radiological	15	15	14	15	7	12	15	14	15
Refrigerant	16	16	15	16	16	16	16	16	16

Chlorophyll a by HUC



Chlorophyll a trends

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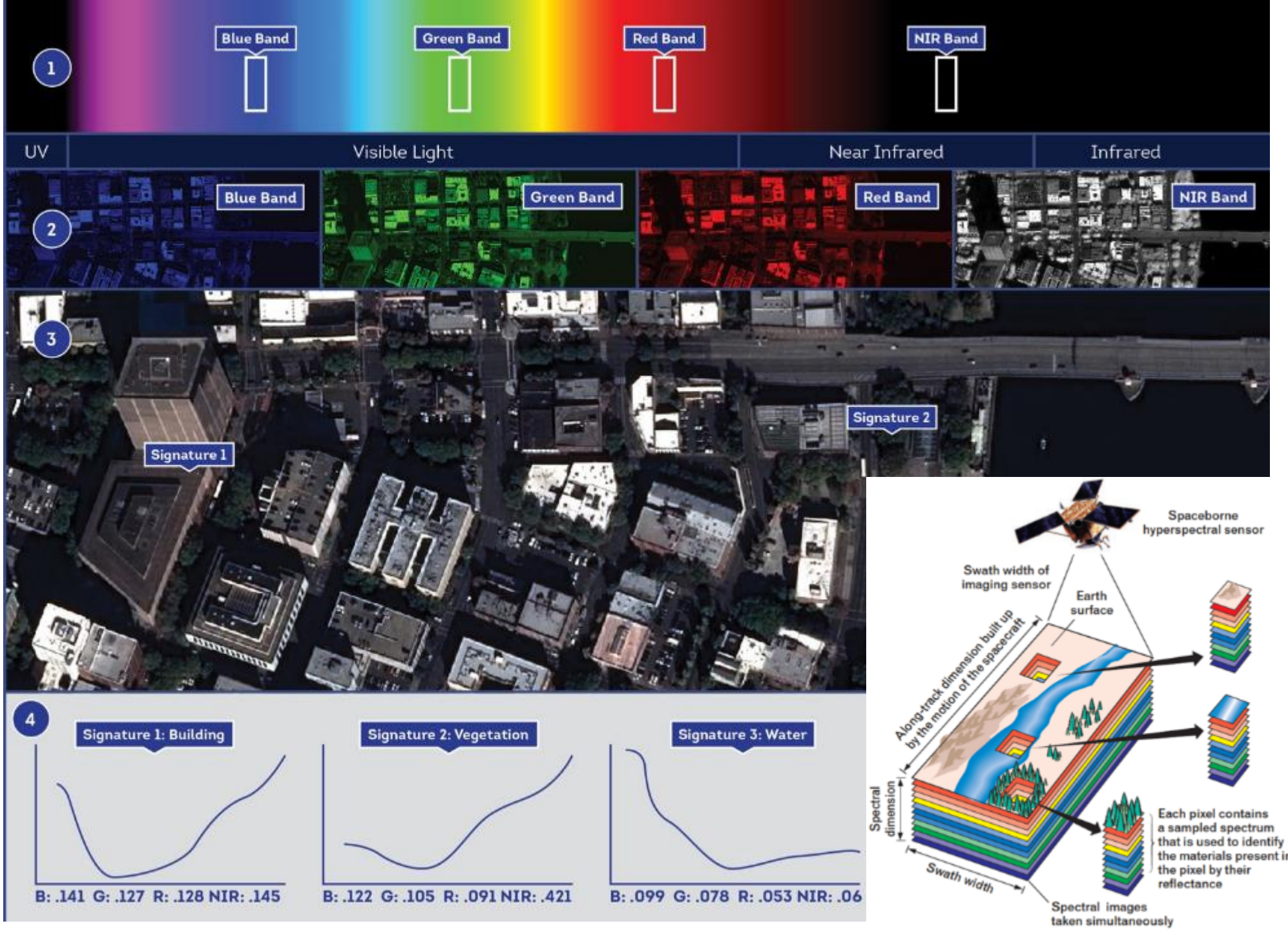
How it Works


1
Blue Band
Green Band
Red Band
NIR Band
UV
Visible Light
Near Infrared
Infrared
2
Blue Band
Green Band
Red Band
NIR Band
3
Signature 1
Signature 2
4
Signature 1: Building
B: .141 G: .127 R: .128 NIR: .145
Signature 2: Vegetation
B: .122 G: .105 R: .091 NIR: .421
Signature 3: Water
B: .099 G: .078 R: .053 NIR: .06

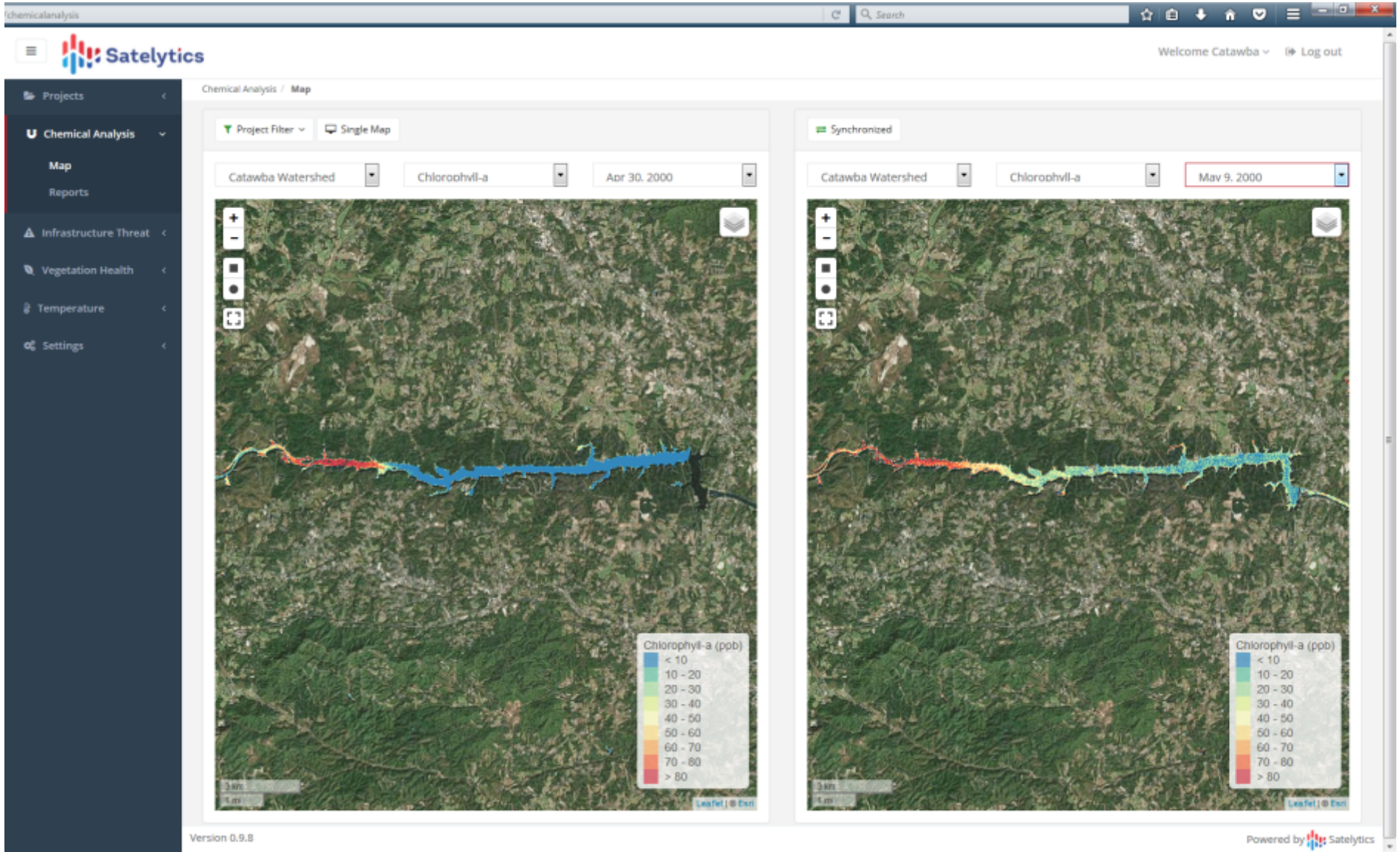
Spaceborne hyperspectral sensor
Swath width of imaging sensor
Earth surface
Along-track dimension built up by the motion of the spacecraft
Spectral dimension
Swath width
Each pixel contains a sampled spectrum that is used to identify the materials present in the pixel by their reflectance
Spectral images taken simultaneously

Accuracy and Range of Constituents Using LANDSAT

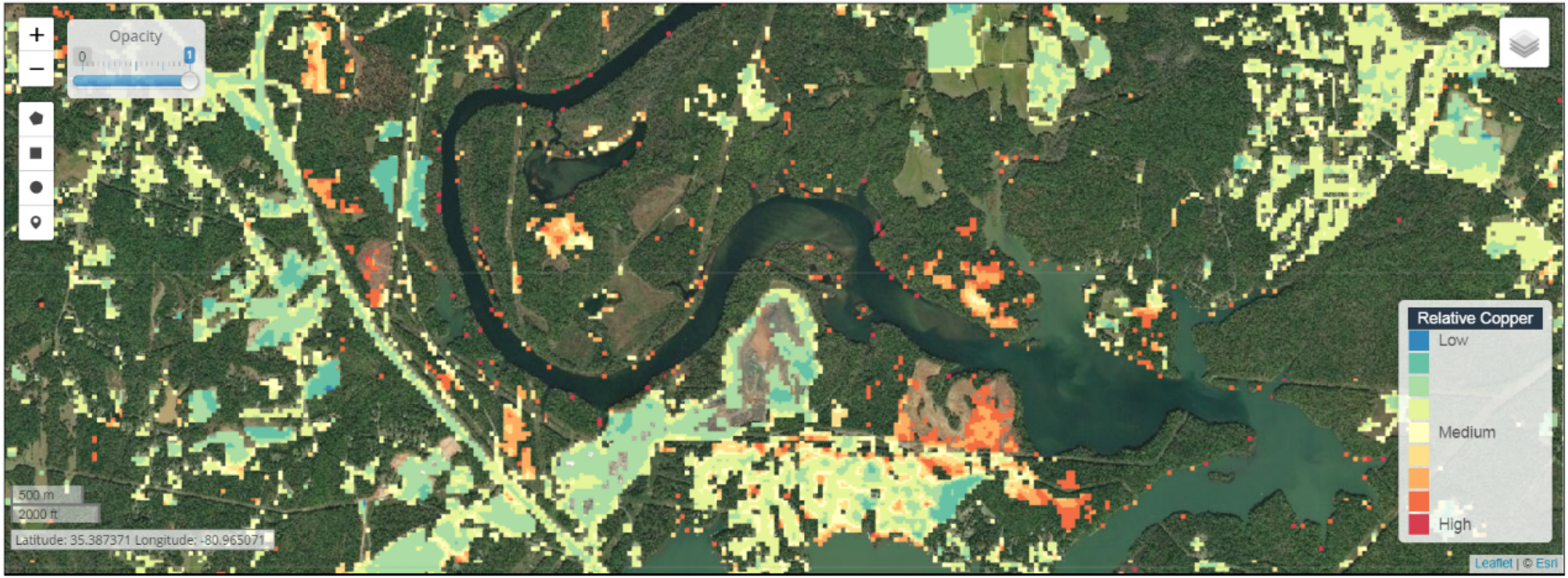
Constituent	Range	Accuracy	Landsat Mission
Total Phosphorus Water (TPW)	0-20 ppb	±6 ppb	L5, L7
Total Phosphorus Water (TPW)	20-100 ppb	±11 ppb	L5, L7
Total Phosphorus Land (TPL)	Relative	Presence/Absence	L5, L7, L8
Cyanobacteria (Phycocyanin)	0-17 ppb	±2 ppb	L5, L7
Cyanobacteria (Phycocyanin)	17-60 ppb	±17 ppb	L5, L7
Water Temperature	1.9 - 27.6° C	±1.52° C	L5, L7
Ground Temperature	1.9 - 27.6° C	±1.52° C	L5, L7
Chlorophyll-a	1-155 ppb	±22 ppb	L5, L7
Arsenic	<20 ppb	±5 ppb	L8
Arsenic	20-75 ppb	±13 ppb	L8
Arsenic	>76 ppb	±14 ppb	L8
Barium	>50 ppb	±9 ppb	L8
Barium	51-100 ppb	±14 ppb	L8
Copper	0-20 ppb	±5 ppb	L8
Iron	<50 ppb	±16 ppb	L8
Iron	51-150 ppb	±34 ppb	L8
Iron	>151 ppb	±13 ppb	L8
Manganese	<40 ppb	±5 ppb	L8
Manganese	41-57 ppb	±14 ppb	L8
Manganese	>58 ppb	±20 ppb	L8
Aquatic Vegetation	Relative	Presence/Absence	L5, L7, L8
Ground Vegetation	Relative	Presence/Absence	L5, L7, L8
Sediment in Water	Relative	Presence/Absence	L5, L7, L8

Satelytics

Chlorophyll a in Lake Rhodiss

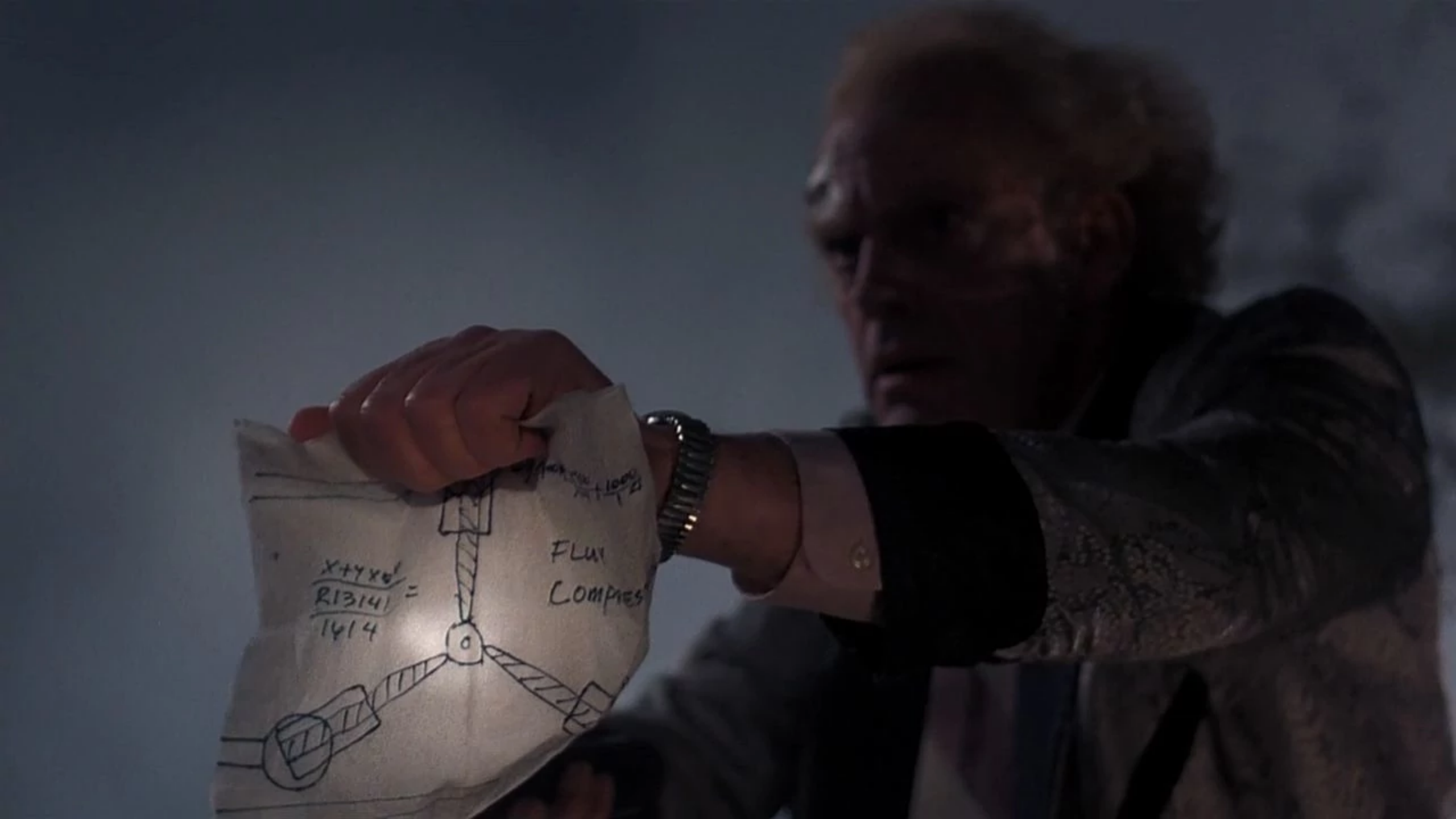


Copper on Land



Quantify water quality concentrations for four parameters

- Chlorophyll a,
- TP,
- Copper,
- Cyanobacteria


FLUX
COMPRES

Usefulness

- Go back in Time
- Not a compliance Tool

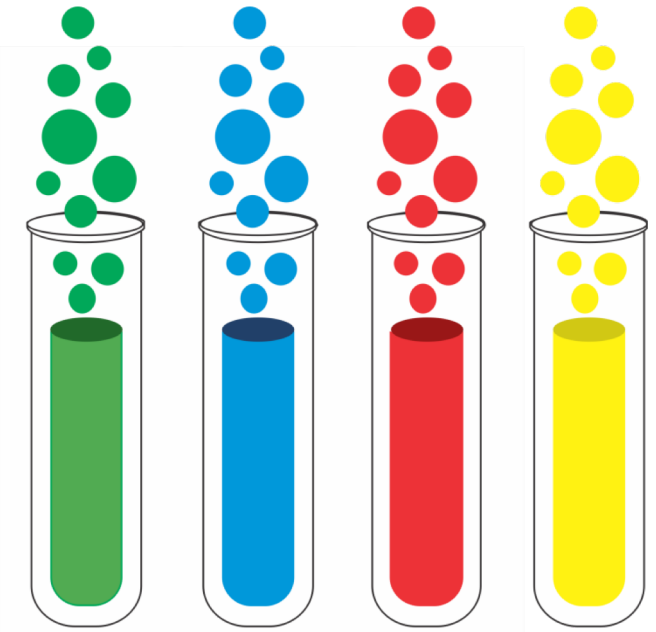
Flux Capacitor - This is What Makes Time Travel Possible
by Widgets, Incorporated

$9,999.99 (1 new offer)

4

Water Quality index

- Combine information on many different parameters
- Characterize overall water quality



Water Quality Index

- Identify parameters of water quality concern
- Rank the importance of each parameter

Parameter	Weighting
Fecal Coliform	16%
DO Saturation	17%
pH	11%
Biochemical Oxygen Demand	11%
Temperature Change	10%
Total Phosphate	10%
Nitrate	10%
Turbidity	8%
Total Solids	7%

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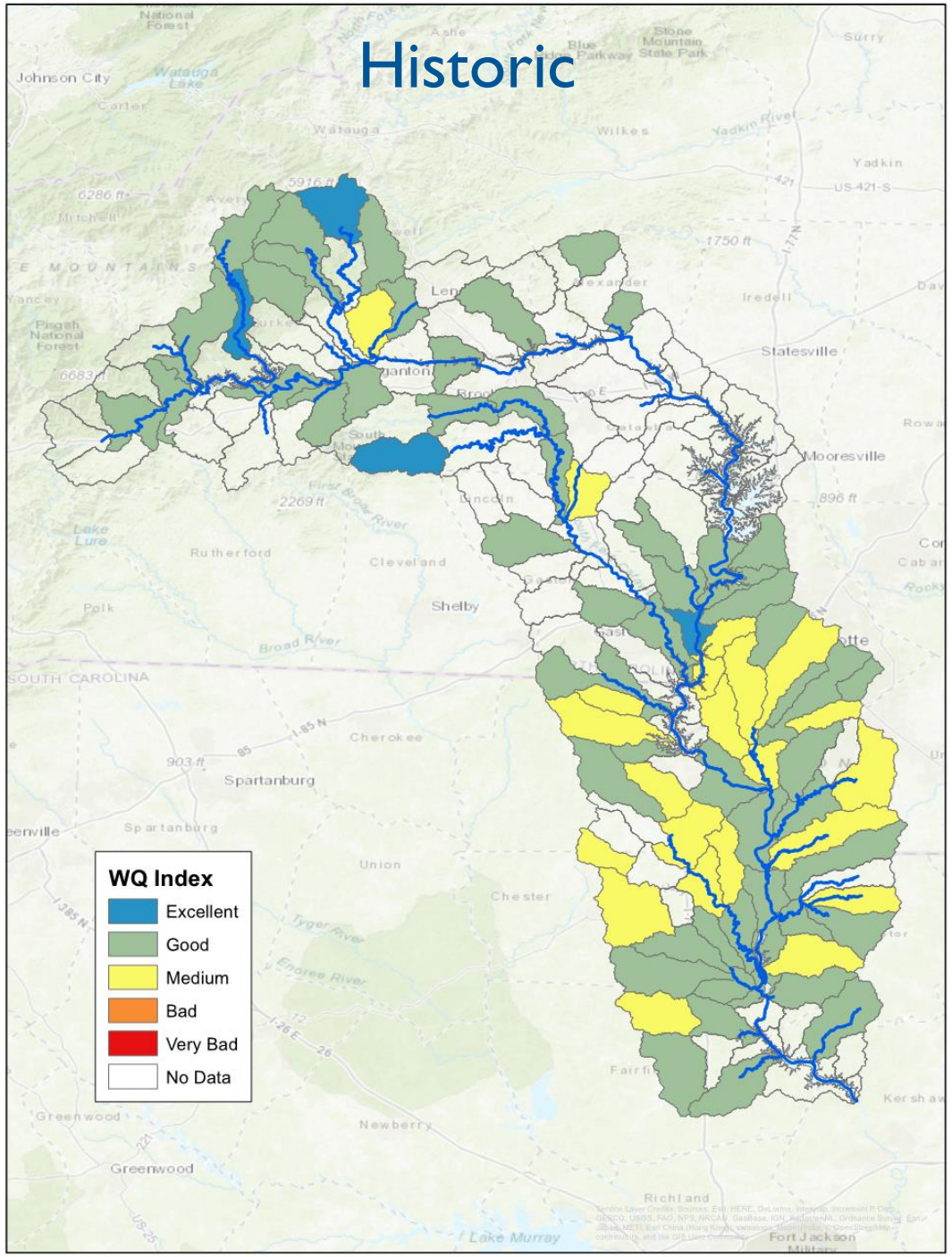
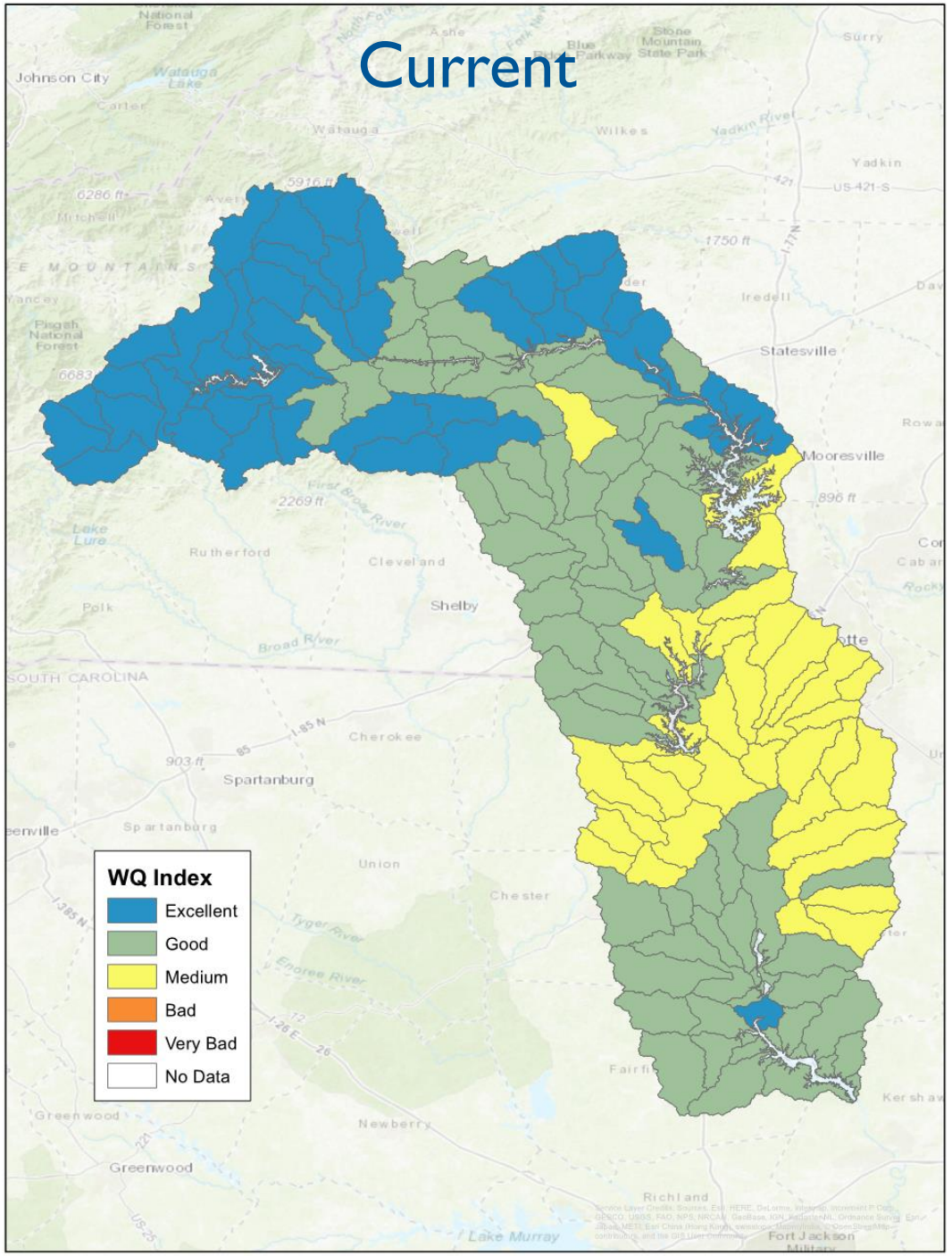
Historic



Current



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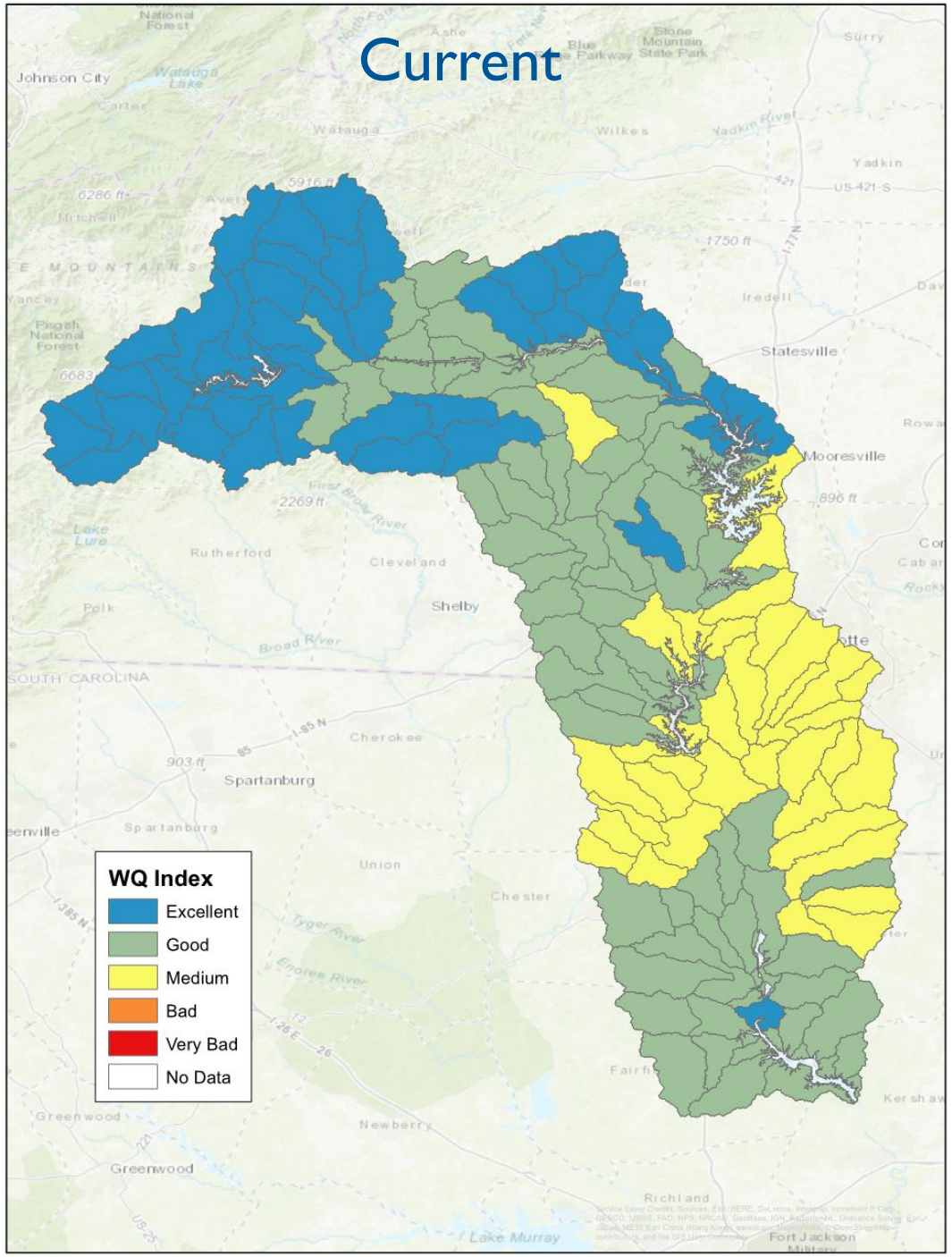
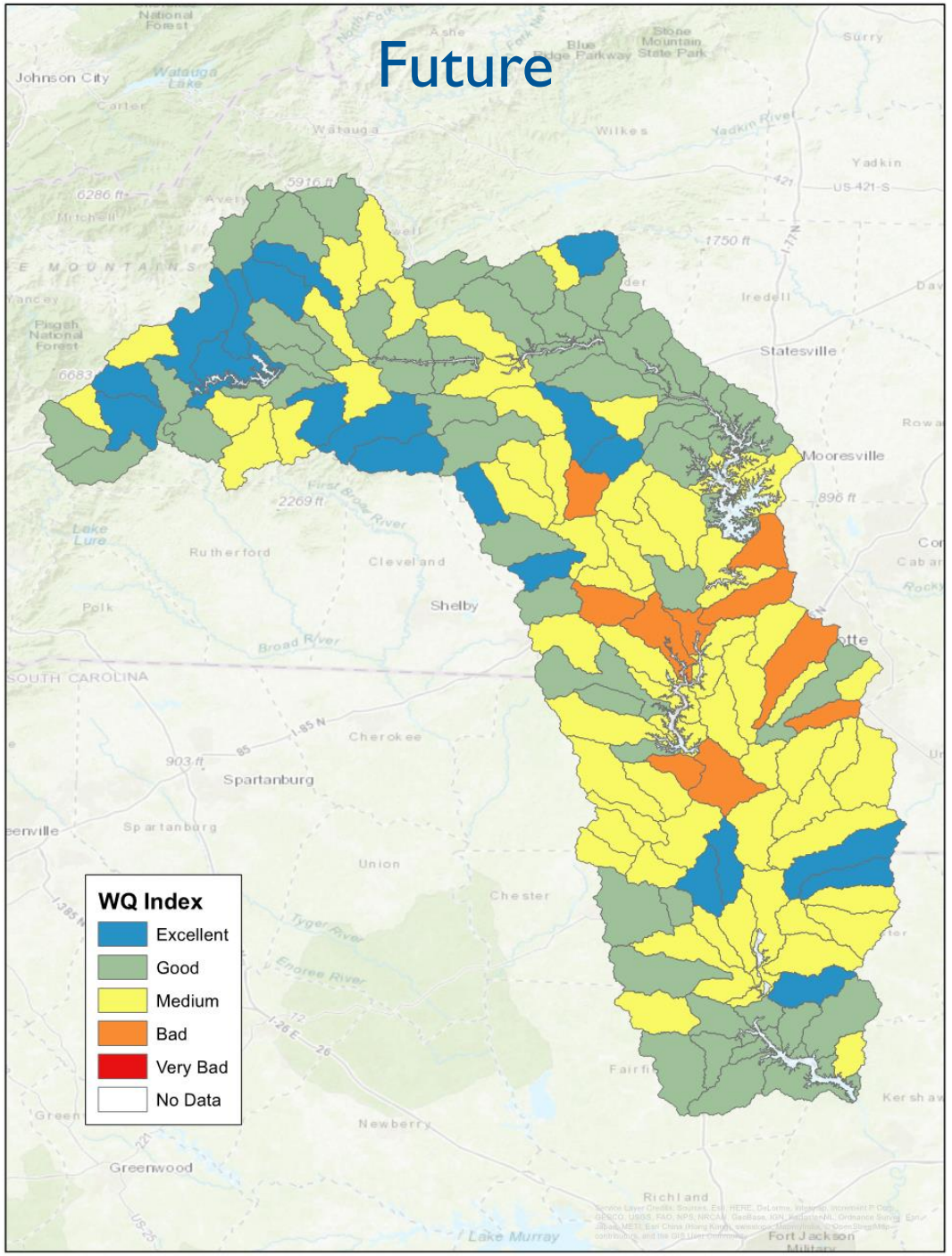
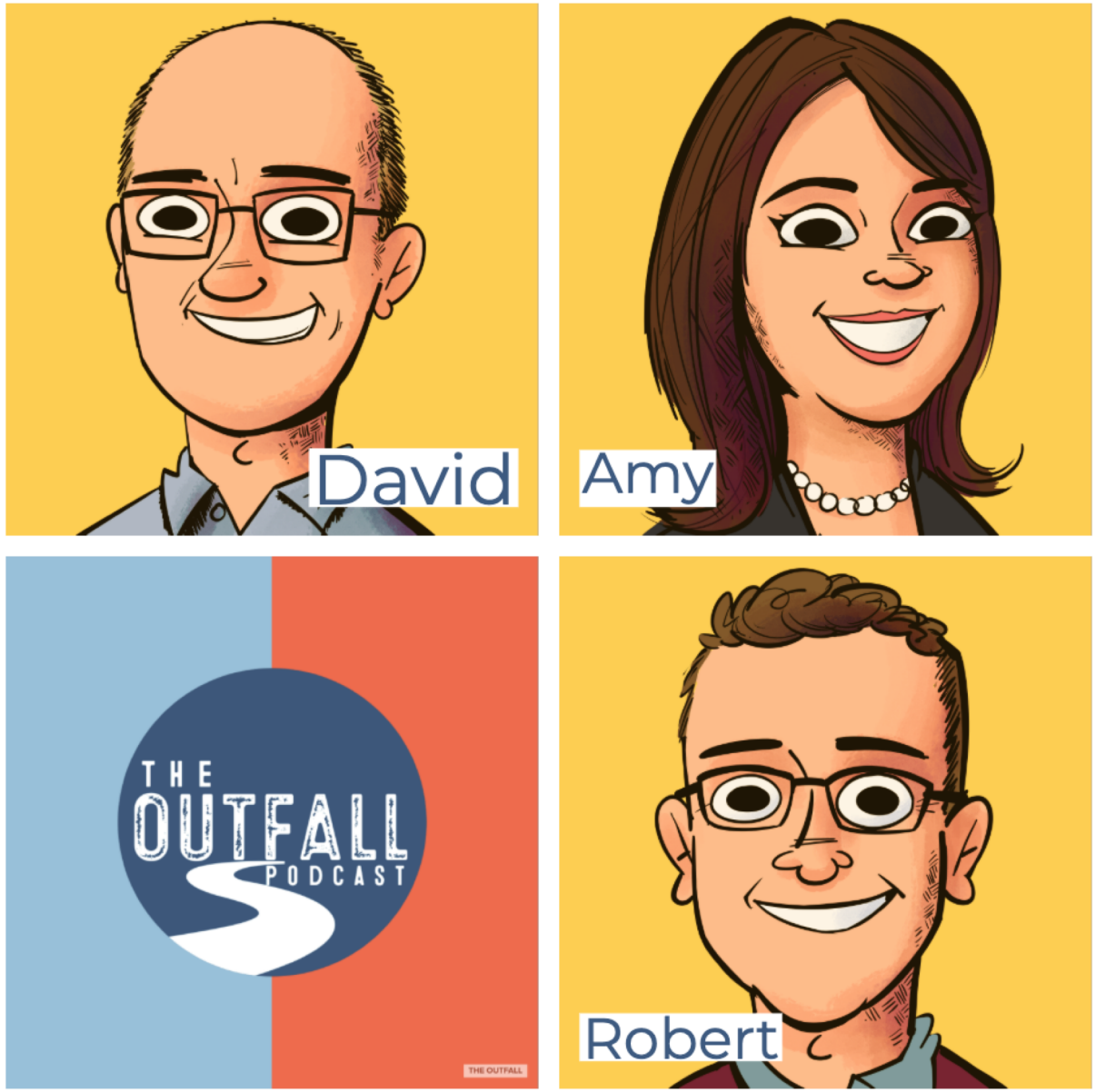


Future



LISTEN AND SUBSCRIBE

The Outfall Podcast



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