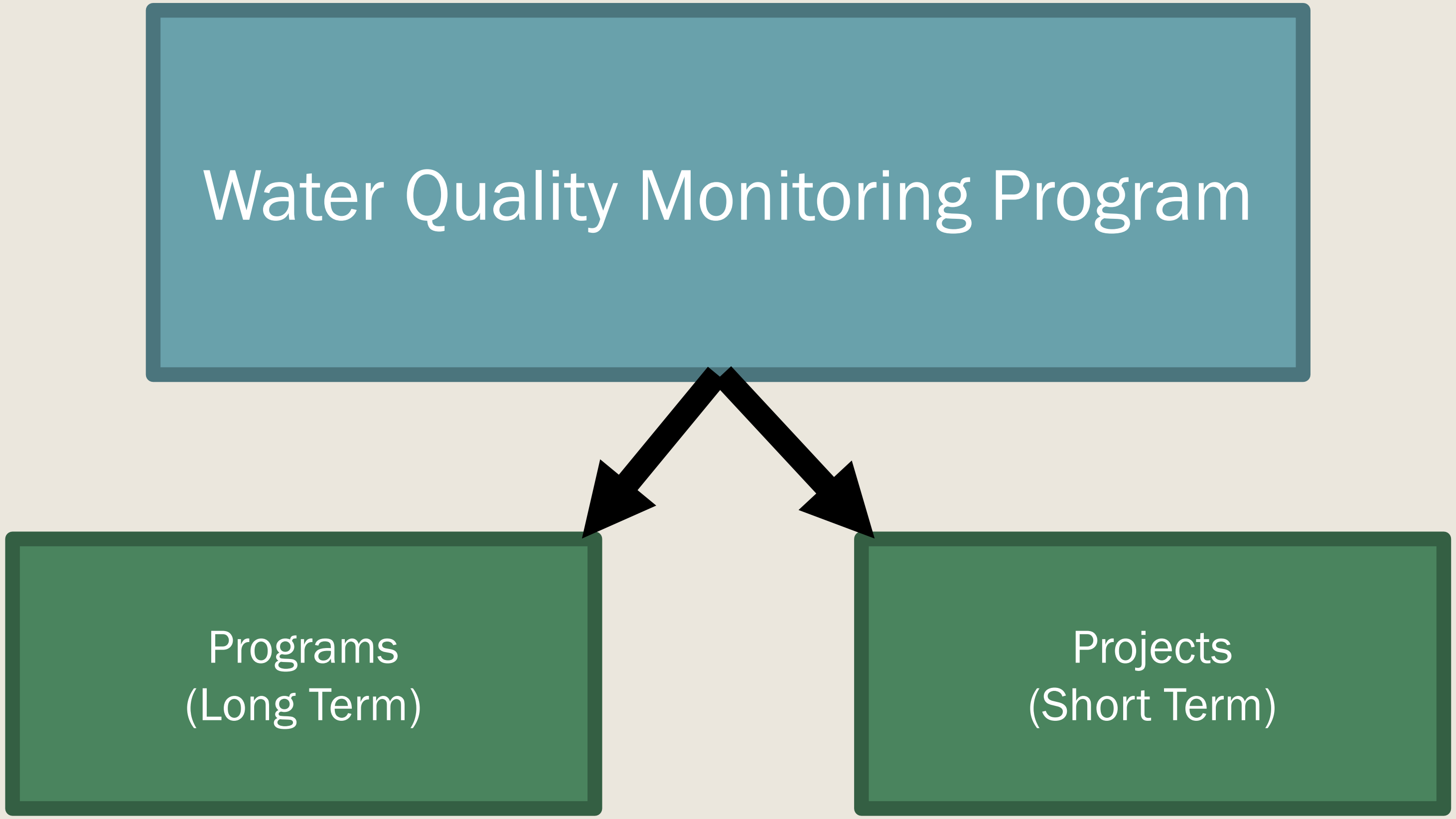
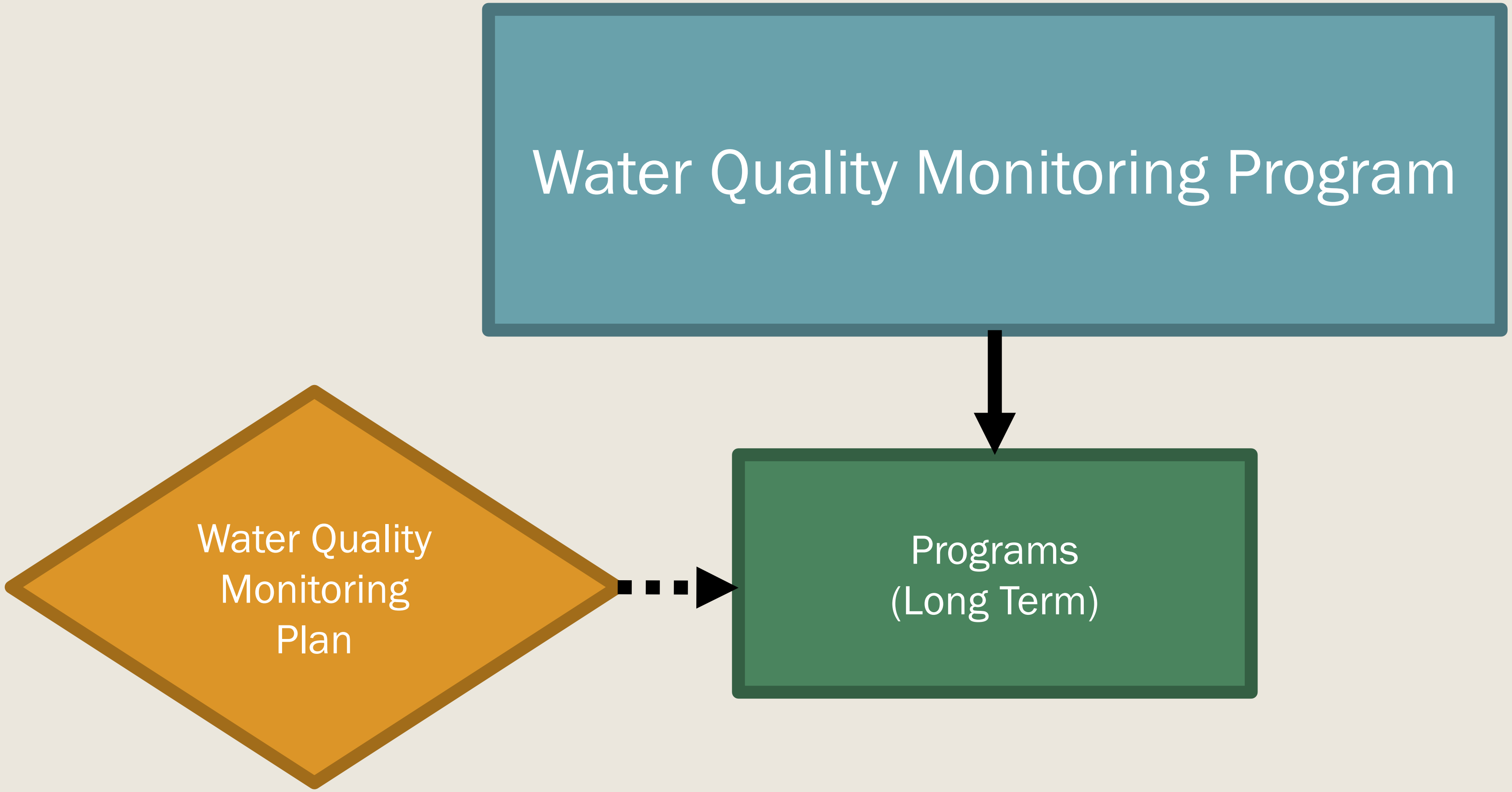
Water Quality Monitoring History
&
Plan Update

In order to plan your future wisely, it is necessary that you understand and appreciate your past. - Jo Coudert


Water Quality Monitoring Program
Programs
(Long Term)
Projects
(Short Term)


Water Quality Monitoring Program
Water Quality Monitoring Plan
Programs (Long Term)

In the early years…

- 1972-1985
  - Projects were developed, but were limited in space and time.
  - *"The NPS relies entirely upon the State of Arkansas to monitor trends in water quality and detect violations of water quality standards within the Buffalo National River."* ~ Buffalo National River Water Quality Plan, 1985

1985 Water Quality Monitoring Plan

- Objectives
  1. Gather data for river corridor for monitoring long term trends
  2. Determine degree certain tributaries were impacted by pollution
  3. Monitor areas with primary contact recreational activities to protect public health

Sites	Parameters	Sampling Regime
9 mainstem 18 tributaries 11 public use (during high use)	Stage Discharge Water temperature Specific conductance Turbidity Fecal coliform	<u>*March - Sept*</u> *River:* 1x/month *Tributaries*: 2x's/month <u>*Oct. - April*</u> *River:* 1x/2 months

Sites	Parameters	Sampling Regime
9 mainstem 18 tributaries 11 public use (during high use)	Stage Discharge Water temperature Specific conductance Turbidity Fecal coliform	*March - Sept* *River:* 1x/month *Tributaries*: 2x's/month *Oct. - April* *River:* 1x/2 months
	Total coliform	*River & tributaries:* Every other month (5x's/year)
	Fecal streptococcus	As needed
	Nutrients- TP, TN Dissolved oxygen (discrete)	*River:* 4x's/year (Seasonally) *Tributaries:* if needed
	Metals	*River*: 2x's/year
	Chlorine	Taken downstream of NPS sewage treatment plants

1993 Water Quality Monitoring Plan

- Objectives
  1. Baseline measurement for river, tributaries, and springs
  2. Monitor short and long-term trends and determine impacts
  3. **Assure compliance with federal and state water quality standards**
  4. Identify water quality problems and solutions

Sites	Parameters	Sampling Regime
9 mainstem 25 tributaries 3 springs 11 public use (as needed)	Stage Discharge Water temperature Specific conductance Turbidity Fecal coliform Dissolved oxygen (discrete)	*River & tributaries*: 6x's/year *Springs & public use:* periodically

Sites	Parameters	Sampling Regime
9 mainstem 25 tributaries 3 springs 11 public use (as needed)	Stage Discharge Water temperature Specific conductance Turbidity Fecal coliform Dissolved oxygen (discrete)	*River & tributaries*: 6x's/year *Springs & public use:* periodically
	Total coliform	periodically
	Fecal streptococcus	As needed
	Nutrients- TP, Cl, SO_4, NH_4, OP, NO_3+NO_2	4 samples/year (Seasonally)
	Metals	As funding allows

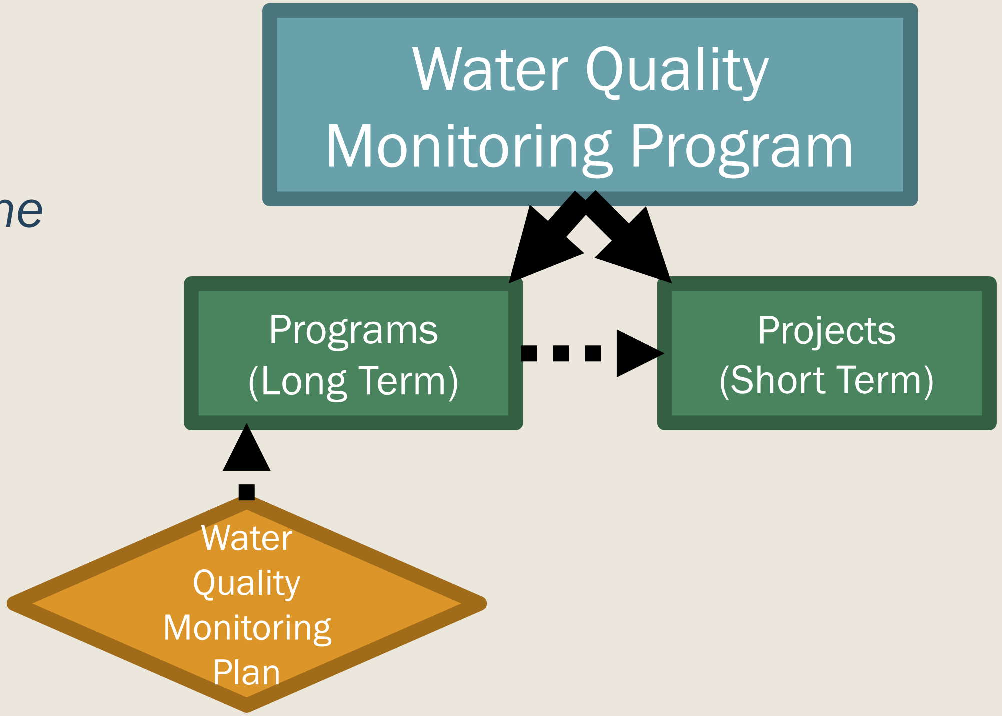
How have things changed over 26 years?

Sites	Parameters	Sampling Regime
9 mainstem 20 tributaries 3 springs 11 public use (as needed)	Stage Discharge Water temperature Specific conductance Turbidity Fecal coliform Total coliform Escherichia coli Dissolved oxygen (discrete) ADEQ Measures: Alkalinity, TSS, TN, TKN, TP, F, Cl, Br, SO_4, NH_3, OP, NO_3+NO_2, TDS	*River, tributaries, & springs*: 4 samples/year (seasonally) *Public use*: as needed

Sites	Parameters	Sampling Regime
9 mainstem 20 tributaries 3 springs 11 public use (as needed)	Stage Discharge Water temperature Specific conductance Turbidity Fecal coliform Total coliform Escherichia coli Dissolved oxygen (discrete) ADEQ Measures: Alkalinity, TSS, TN, TKN, TP, F, Cl, Br, SO_4, NH_3, OP, NO_3+NO_2, TDS	*River, tributaries, & springs*: 4 samples/year (seasonally) *Public use*: as needed
17 tributaries	Dissolved oxygen (continuous)	*May - Sept.* *Tributaries*: 6 sites/year on 3 year rotating basis

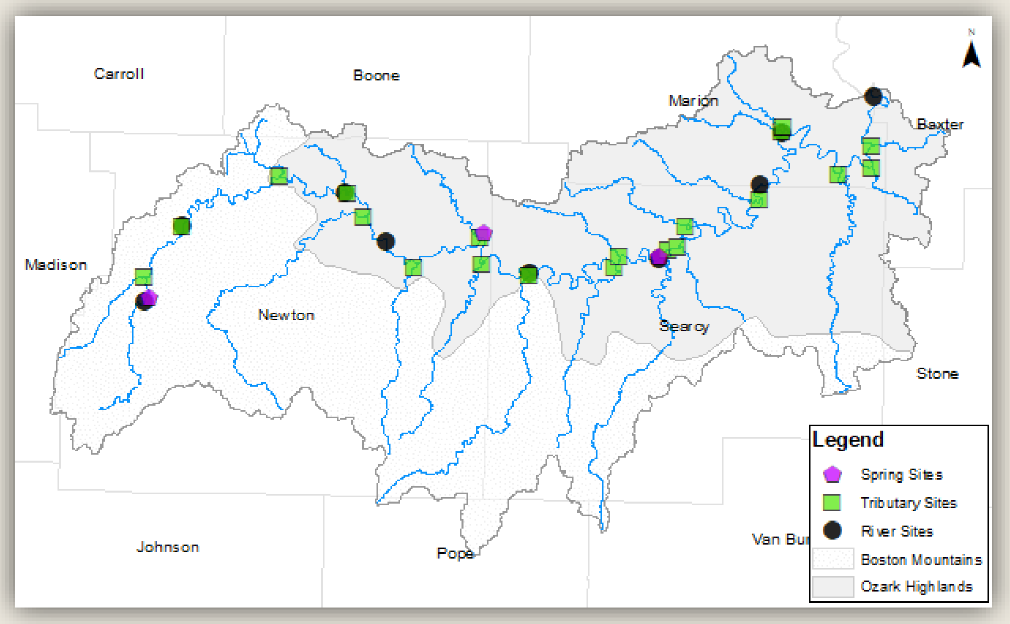
Currently…

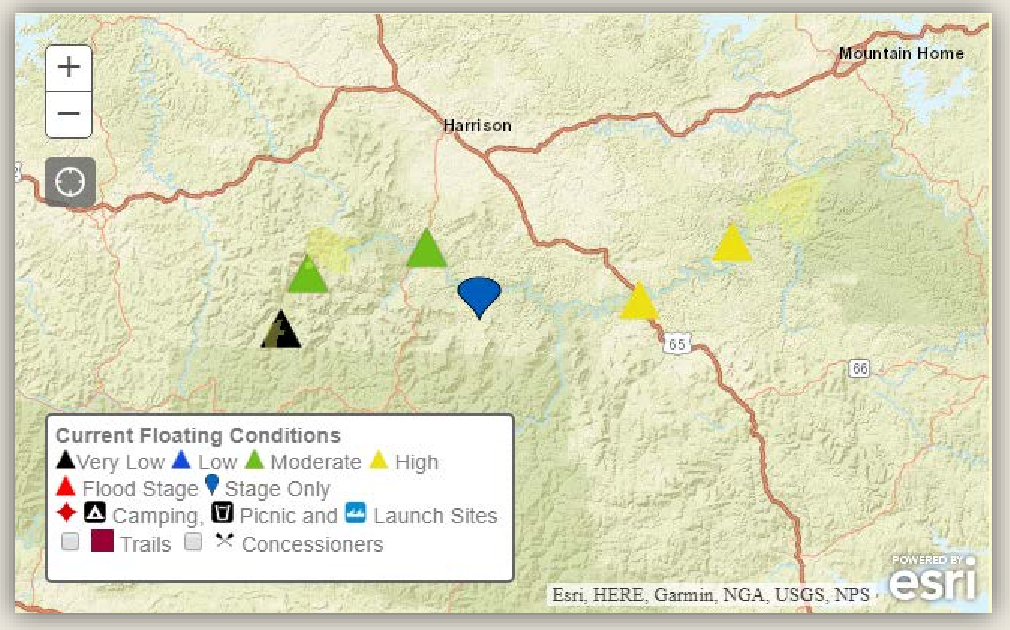
- Objectives
  1. ~~Baseline measurement for river, tributaries, and springs~~
  2. *Monitor short and long-term trends and determine impacts*
  3. *Assure compliance with federal and state water quality standards*
  4. *Identify water quality problems and solutions*
  5. ***Inform and support targeted research projects***



Design Considerations

- Monitoring objectives
- Historical continuity
- Spatial and temporal variability
- Achievability
- Flexibility
- Complimentary





Design Options To Consider

Design	Type	Sites	Frequency	Samples per year
Current	Fixed	9 mainstem 20 tributaries 3 springs	Quarterly	32 sites 4 times/year **128 samples**
Alt 1	Fixed	9 mainstem 20 tributaries 3 springs	Monthly	32 sites 12 times/year **384 samples**
Alt 2	Fixed	5 mainstem (at gages) 3 tributaries (targeted, rotating) 3 springs (targeted, rotating)	Monthly	11 sites 12 times/year **132 samples**
Alt 3	Fixed + Random	5 mainstem (at gages) 30 tributaries (6/yr for 5 years)* 3 springs (targeted, rotating)	Monthly	14 sites 12 times/year **168 samples**
Alt 4	Fixed	9 mainstem	Twice-monthly	9 sites 24 times/year **216 samples**
Alt 5	Fixed	5 mainstem (at gages)	Twice-monthly	5 sites 24 times/year **120 samples**

*Consistent with HTLN invertebrate sites

Next Steps

- New data analysis project with University of Arkansas
- Goal = maximize monitoring efficiency and impact
- Explore long-term data to:
  - *Understand patterns, trends, and variability*
  - *Calculate power of different design options*
  - *Provide insights into future monitoring plans*

Let us know what you think!

- Objectives?
- Variables?
- Design?

Email us your ideas at buff_information@nps.gov