White River Algae Meeting

December 14th, 2018

1:00 @ Sheriff's Training Room

Meeker, CO 81641

Welcome and Introductions: Facilitator, Callie Hendrickson, welcomed everyone. She noted that the purpose of the meeting is to hear reports from USGS, CPW and the Conservation Districts.

USGS 2018 Work Review and Report:

- Mike Stevens – Hydrologist:
  - Goal: to document and understand benthic algal occurrence characteristics and controls at multiple locations on the White River (WR).
  - 2018 Work Plan Elements 1.) stream hydraulic/channel characteristics, 2.) historical analysis, 3.) water quality
  - Site locations consist of CPW (11) sites, USGS sites (4), river algae study sites (19 – one site was removed during the field season)
  - Stream hydraulics/channel characteristics: 2018 is the first year of measurements and data collection. Peak flow velocity and hydrophone measurements are planned for future years
  - Peak flow measurements: Data was collected at 19 sites during high flow. Limited runoff in the spring provided opportunity to characterize the lower range of peak flow mobility potential.
  - Streambed particle – size analysis 2018: 300 streambed particles were measured at each site. Streambed movement is dependent on particle size, orientation and embeddedness.
  - Historical analysis: Data collected by CPW (2016) and Hydrosolutions (2017) suggests that several factors may control algal growth. Synthesis of historical data and relevant studies informed objectives and approaches for the study
- Natalie Day – Biologist:
  - Water Quality Trends (Preliminary): Used to provide answers about sources of nutrients and timing of change. They looked at variables: trends adjusted for variability due to streamflow and season, timing of nutrient trends, comparison of trends among sites and streamflow statistics.
  - Water Quality Methods: Using continuous discharge records, nutrient data representing all seasons and discharge records to evaluate flow-adjusted nutrient trends in concentration and flux at four sites.
  - Trend Site Locations: Two sites have continuous discharge records during a period of 1999-2017. Measuring Kjeldahl Nitrogen and Total Phosphorous
  - Water – Quality Concepts
    - Concentration vs Flux
    - Concentration: The amount of nutrient measured in a unit volume of water.
    - Flux: Total amount of nutrient delivered downstream over a period of time. Informative when talking about changes over a year in concentration.
  - Kjeldahl Nitrogen (charts)
    - Percent in Kjeldahl Nitrogen changes (2000-2017):
      - Decrease in concentration
      - Decrease in flux
  - Total Phosphorous (charts)
    - Percent in Total Phosphorous changes (2000-2017):
      - Increases in phosphorous concentration then decreases as you go down river
      - Increases in flux
  - Water – Quality Trends Summary (Kjeldahl Nitrogen):
    - Little to no change in annual concentration at WR above Coal Creek and the tributaries (N. Fork and S. Fork WR)

        - Approximately a 13% increase in flux at these sites
        - Large increases in concentration occurred during spring at high flows and decreases occurred during winter months
    - Water – Quality Trends Summary (Total Phosphorus):
        - Substantial increases in concentration and flux at WR above Coal Creek and tributaries (N. Fork and S. Fork WR)
        - Largest percent increases occurred in the tributaries.
        - Spring high flows show the greatest increase in phosphorus concentrations
    - Water Quality Trends Interpretations
        - Trends in nutrients have been underway for decades
        - Changes are occurring seasonally
        - Similar nutrient trends are occurring in both the North and South Forks
        - Basin-wide patterns may be indicative of larger, regional changes of sources or processes
        - Comparisons of the magnitudes of trends may help key in on areas that are most important to understanding algae
    - Historical Water Temperature
        - Periods 1979-1984 and 2007-2017
        - Mean daily temperatures were collected
        - Shows some increase in temperature
    - Literature Review:
        - Studies in areas outside of the WR Basin provide information that helps interpret the WR data
        - Phosphorous levels are on the rise in many western U.S locations
        - Review of journal articles and published materials is ongoing and continues to inform a conceptual model for algae in the basin
- Mike Stevens
    - Water Quality
        - 2018 is the first year of collecting large scale Water Quality
        - Data collection will intensify next year
    - Nutrient Probe Reconnaissance
        - Nitrate concentrations were consistently low at all locations
        - Nitrate concentrations were measured at 10 locations in the WR. This was used to assess a preliminary distribution of nutrients along different reaches of the river.
        - Larges loads observed between the confluence of the N and S forks and at the State of Colorado streamflow gage (Sleepy Cat)
        - Highest concentrations observed in the N Fork near the Forest Service boundary
    - Continuous Water Quality 2018
        - Changes in oxygen levels can be related to algal productivity
        - When the algae dies off, it can reduce dissolved oxygen
        - Dissolved oxygen records were collected at all 19 sites. Records are being corrected for calibration changes and quality assured this fall and winter
        - BLM lent USGS some equipment for this
    - Algae 2018
        - Collected in association with continuous water-quality monitors
        - Algal samples collected at 19 sites and analyzed at USGS lab
        - Many types of algae were found
        - Cladophora was found at every site
        - More algae was found at the down stream sites compared to the upstream ones.
        - Peak algae happened at different times in different locations
    - Nitrogen – Oxygen Isotopes of Nitrate
        - Isotopes of Nitrogen and Oxygen in Nitrate may be used to identify sources of nutrients
        - 2018 fieldwork

                - Isotope samples were collected and analyzed for nitrate concentrations at 6 locations. Concentrations were to low for isotope analysis
                - Sampling and nitrate analysis are ongoing.
        - Next steps:
            - Current proposal for 2019
                - Similar to 2018
                - Peak-flow data collection, scouring-flow analysis
                - Water-quality sampling
                - Algae sampling
            - Discussion of possible changes
                - Taxonomy (identification and quantification)
                - Water temperature monitoring
                - Monitoring of algae during growing season (peak bloom varies by site)
                    - Dissolved oxygen and temperature monitoring
                    - Photo documentation of algal life stage
                    - Observers may assist with some of these additional tasks

See http://www.whiterivercd.com/white-river-algae-working-group.html for Power Point presentation and more info.

- Notes:
    - Phosphorous levels increasing: Consider dust a potential contributor
    - Isotopic analysis Questions/Discussion.
        - Need to do nitrate samples during high flows
        - Consider doing tissue sampling
        - Consider looking at sediment and water
        - N & S forks have same trends in nitrate and phosphorous
        - Consider radionucleotides in isotope tests
    - Bio Mass:
        - Biomass is the same in N&S forks
    - Stream structure:
        - Widening or narrowing of the river
        - Consider water clarity

<u>CPW Work Review and Update:</u>

- Tory Eyre – Biologist
    - CPW is still waiting on results from the lab
    - Overview:
        - CPW Pond Nutrient Sampling
            - Inflows and outflows were tested at Bel Aire, Stock Ponds, and the Sleepy Cat ponds in March and July 2018
        - CPW and TU Macroinvertebrate Sampling
            - 10 sites established in 2015 and sampled using semi-quantitative method every year since. Quantitative sampling was added in 2018.
            - Sampling sites were established above and below two locations with aerial pesticide application. Both sites were sampled pre-spray, post spray and again about one month after spraying. Only one location used aerial spraying of pesticides. It had increased algae present during post spray sampling.
        - Fish Population Surveys
            - Used to asses health of salmonid populations in the river. Information would be used to make management decisions (e.g., stocking, special regulations)
            - 2006 there were four standard study sites spanning 37 miles of the river

        - Information gathered included: estimated size of population for each species, size structure of populations, spawning success from year to year, and presence of disease.
    - Sites were sampled by raft electrofishing, jet boat, raft, and bank electro fishing. Current data is raw and will get analyzed at the lab to be ready to present at the next meeting.
- Time-Lapse Photography of Algal Blooms
    - Used to address how the algae changes seasonally. Using a time-lapse specific camera in 2019 should prove to be more effective.
- Lake Avery Water Release
    - About 1,700AF of water was released. 7.6 ft drop in water surface elevation.
    - Monitored during and after the release
    - Nutrients and quality were measured downstream of the release point

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Nitrate Sampling:

- Tristan Nielsen(Conservation District) collected water samples from the river on a weekly basis. Kurt Nielsen (Sanitation District) tested the samples and recorded the nitrate levels of the water (Attachment A).

Public Input/Comment:

- Consider Light, Turbidity data
- Keep an eye on dredging and changes in the river
- Kjedahl samples, are Dissolved
- It is good to hear broad conversation. Cost has been a concern but the data that will be collected will be very valuable in the future. The work going beyond nitrogen and phosphorous is appreciated.
- Suggestions were made to talk with Matt Weaver who is doing a lot of the work that is happening in the river. The Army Corps is involved in the project.

Budget Update and Requests:

- Callie presented the current budget that includes the grants received for the project: CSCB Matching Grant, and the Basin Round Table WSRF grant. (Attachment B). Project cost for 2019 was reported at the meeting to be $139,000 in error. Corrected amount for 2019 budget is $163,807. TAG entities 2019 contributions are noted in the attachment.

Ending Comments:

- Ken feels they are on course and likes how the proposal looks in moving forward. A lot that happened this year won't have to be done in the future. It is important to continue looking at the local effects. "It's all about targeting the algae at it's peak".
- Perry Cabot (CSU) has had luck in using security company phone images for the "real time" images to track changes on the river.
- It would be helpful to get local/observer photos. There are deficiencies in recording stream flow and separating North and South fork flows.
- Would anyone want to "adopt" a monitoring gauge for real time data. Costs: $33,000 initial cost $17,000 per year.
- Using a UV absorbance meter may be useful to measure for turbidity at reasonable measurement.
- Locals would be able to help with periodic photos. specific requirements are needed from USGS.
- Get Army Corps reports to learn what type of work is being done.
- Need wildfire boundaries from USFS.
- Get specs from USGS on necessary imaging equipment so it can be determined if Rio Blanco County or Colorado Northwestern Community College (CNCC) could get this type of equipment.

- Questions on the landowner surveys noting that improvements started in the 90's and are continuing. Some going on the S. Fork.
- The USGS may be interested in observing the irrigation diversions as they work in the river each year.
- There is an air monitoring station on Burro Mountain that may be useful to consider using data from.
- Note about tissue sampling. USGS noted it is hard to link sources to those.
- Perry Cabot: CSU has an expert in algae and could possibly get involved.
- Next conversation for January meeting:
    - Air monitoring station
    - Local photos
    - Water temperature
    - Stream flow gauges on the North and South fork
    - Turbidity UV data
    - Instream/channel modification (past and future work). The Army Corps is interested in coming back to the group.
    - Fire specific locations
    - Quantitative mapping
    - Algae specific types – CSU has specialists
    - Budget

Attachment A

USGS NITRATE TESTING

SIGHT	SAMPLE DATE	SAMPLE TIME	TEST DATE	TEST TIME	RESULTS mg/L
Bufford Bridge	20-Aug	8:45	23-Aug	1:00pm	0.002
Wakara Bridge	20-Aug	8:00	23-Aug	1:00pm	0.002
Bufford Bridge	27-Aug	7:20	27-Aug	8:10	0.003
Wakara Bridge	27-Aug	6:50	27-Aug	8:10	0.002
Bufford Bridge	10-Sep	8:56	10-Sep	10:30	0.001
Wakara Bridge	10-Sep	7:30	10-Sep	10:30	0.003
Bufford Bridge	18-Sep	7:00	18-Sep	7:45	0.003
Wakara Bridge	18-Sep	6:30	18-Sep	7:45	0.001
Bufford Bridge	25-Sep	7:05	25-Sep	7:45	0.001
Wakara Bridge	25-Sep	6:35	25-Sep	7:45	0.001
Bufford Bridge	7-Nov	7:35	7-Nov	9:45	0.001
Wakara Bridge	7-Nov	7:10	7-Nov	9:45	0.001
Bufford Bridge	13-Nov	7:35	13-Nov	9:15	0.001
Wakara Bridge	13-Nov	7:10	13-Nov	9:15	0.002
Bufford Bridge	19-Nov	7:25	19-Nov	8:30	0.001
Wakara Bridge	19-Nov	6:55	19-Nov	8:30	0
Note:	The test minimum detection limit is .001mg/L				
	USGS was looking for a .06 or higher to run the isotope sampling/testing				

Attachment B

2019 Algae Study Funding				
2019 Costs		**In-Kind**	**Cash**	**Total Cash**
	USGS Original SOW		$ 163,807	
	Administration		$ 10,000	
	Total 2019 Cost			**$ 173,807**
2019 Commitments				
	USGS		$ 51,029	
	WRCD - CSCB Grant		$ 15,000	
	DCCD - CSCB Grants		$ 15,000	
	YWG Roundtable WSRF Grant		$ 41,000	
	CRWCD		$ 5,000	
	Meeker Sanitation		$ 3,500	
	RBWCD		$ 2,000	
	Town of Meeker		$ 8,000	
	TU		$ 2,500	
	Walton Foundation			
	ECR		$ 10,000	
	Westlands Ranch			
	RBC Farm Bureau			
	Yampa Valley Fly Fishers			
	BLM (sondes)	Sondes		
	County (drones)	Drone pictures		
	Total Commitments			**$ 153,029**
				$ 20,778