NC Nutrient Criteria Development Plan – Scientific Advisory Council
(Meeting No. 5 – Conference Call)
11/18/2015

Attendees

SAC meeting facilitator: Andy Sachs

NC Wildlife Resource Commission (WRC) Presenters – Lawrence Dorsey, Ryan Heise

SAC members in attendance:

Marcelo Ardon
Bill Hall
Lauren Petter
David Kimmel
Linda Ehrlich
Hans Paerl
Clifton Bell
Michael O'Driscoll
Nathan Hall
James Bowen
Rich McLaughlin

SAC members not participating:

Martin Lebo
Deanna Osmond
Astrid Schnetzer

NCDENR NCDP Team members in attendance:

Steve Kroeger
Carrie Ruhlman
Tammy Hill
Connie Brower
Pam Behm
Jing Lin
Christopher Ventaloro
Jeff Manning
Jucilene Hoffman
Jim Hawhee
Cyndi Karoly
Jennifer Schmitz

Others:

Andy McDaniel – CIC Member
Anne Coan – CIC Member
Keith Larick –CIC Alternate

Nora Deamer-DWR
Heather Patt-DWR

Call ins:

Tiffany Crawford –EPA Headquarters
Annie Godfrey-EPA Region 4
Sushama Pradham
Jan Mandrup-Poulsen
Tim Spruill
Grady (no last name provided)
Others – Identity unknown

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Meeting notes

All questions, comments and answers are paraphrased

Contents

1. **Convene** (Andy Sachs)
    a. Roll call.
    b. Review of agenda for the call-in meeting.
        i. High Rock Lake fisheries data
        ii. High Rock lake correlations discussion
        iii. Homework – conceptual models & ranges with scientific backing
2. **Wildlife Resource Commission (WRC) High Rock Lake Fish Data** (Lawrence Dorsey & Ryan Heise)
    a. Discussed WRC monitoring and data in HRL
        i. Monitoring activities
        ii. Data available
        iii. Q & A session
        iv. Wildlife Diversity Program (Ryan Heise)
    b. Monitoring activities in HRL
        i. Species of interest
            1. Largemouth Bass
            2. Crappie
            3. Striped Bass
        ii. Monitoring efforts
            1. Reservoirs sampled at 3-year intervals
            2. Sampling conducted through each reservoir

3. Collect catch per unit effort data for electrofishing and trap netting
4. Metrics calculated:
    - Mean catch per unit effort
    - Mean total length
    - Relative weight
    - Age distribution
    - Size distribution
    - Length at age
5. Species specific information
    - Largemouth Bass
        i. Electrofishing conducted April-May
        ii. Goal to collected 400 fish or expend 23,000 seconds of effort
    - Crappie
        i. Trap netting surveys October-November
        ii. Goal to collect 500 fish or expend 48 net-nights of effort
    - Striped Bass
        i. Stocked species. Not naturally reproducing in HRL.
        ii. Gillnetting sporadically, but ineffective due to bycatch
        iii. Best gillnet survey was in 2006
        iv. Work with angling groups to collect length, weight, and age data
6. Data available
    - Data from 2000 available in Microsoft Excel format – available upon request
    - Completion reports in PDF format
    - Most complete data are for largemouth bass and crappie surveys
7. Q & A topics
    - Funding
        i. Funding only supports monitoring of gamefish species
    - General health of the fishery at HRL
        i. Deemed to be a healthy fishery
        ii. Largemouth Bass are best in the state
        iii. Crappie undergoing management changes to optimize size and overall health
        iv. Striped Bass – harder to estimate, but existing data suggests they are healthy
    - Monitoring outlook

i. Committed to continue monitoring into the foreseeable future at HRL
ii. HRL is a well-known angler destination

8. Wildlife Diversity Program (Ryan Heise)
    - Focuses on non-game species, specifically:
        i. Mussels
        ii. Crayfish
        iii. Snails
        iv. Non-game fish
    - Efforts are discussed in the WRC Wildlife Action Plan
    - There are few federally or state listed threatened species in HRL. This is mostly due to those species being stream/river dwelling species.
    - Natural heritage program may have additional data on non-game species.
9. Question/comments
    - Clifton. B – Concerning recreation use, do you receive complaints about "yuck" factors in the lake or fish disease or abnormalities?
        i. Answer: No. Complaints are typically about catch sizes or numbers of fish caught. Also, generally do not receive complaints about fish health.
    - Bill H. – Mentioned adverse conditions in 2002. Can you explain?
        i. Answer: Due to drought and continued draw-off of water by APGI, lake levels were down 20 feet. There were fish kills associated with this drying. APGI has since modified their procedures to help prevent this in the future.
    - Carrie R. – Is sampling for species of interest done in the same year or spread out over the 3-year cycle?
        i. Answer: Sampling is done each season for the appropriate species.
    - Bill H. – The fish species being sampled exist at the upper end of the food chain. Can anything be said concerning lower trophic level species?
        i. Answer: The good condition of the game species, especially striped bass which feed primarily on shad, would suggest that lower trophic level species are doing well
        ii. High nutrient levels support forage species
    - Marcello A. – How are striped bass stocked?

i. Answer: Striped bass are stocked at a rate of 5 fish/surface acre. They are stocked as fingerlings at 2-4 years of age.

3. **High Rock Lake Correlations** (Jing Lin & Pam Behm)
   a. Review of the HRL correlations document previously distributed to SAC members
      i. Review of major characteristics of HRL
         1. Seasonality
         2. Spatial variation
         3. Dynamic system
         4. Nitrogen abundant, but
            - During summer can be N-limited or co-limited by N and P
      ii. Correlations discussed in document:
         1. Chlorophyll-a and phytoplankton data (total unit density, total biovolume)
         2. Duration curve for chlorophyll-a distributions
         3. Correlations using year-round & summer data for HRL station YAD152C
            - Chlorophyll-a and TP, TN, TOC, flow, temperature, and turbidity
            - pH and chlorophyll-a, NH3, TP, TN, TOC, flow, temperature
            - DO (surface & bottom) and BOD, chlorophyll-a, TP, TN, TOC, flow, temperature, turbidity
            - Turbidity and chlorophyll-a, TP, TN, TOC, flow, temperature
      iii. Discussion of how correlations were made
         1. Correlation coefficient – r
            - Pearson product-moment correlation for each pair of response variables
            - Summarizes strength of linear relationship between variables
               i. The closer r is to one (1), the stronger the **positive** correlation (i.e. both variables increase or decrease)
               ii. The closer r is to zero (0), the **weaker the relationship** is between the variables (no relationship observed)
               iii. The closer r is to negative one (-1), the stronger the **negative** correlation (i.e. one variable increases while the other decreases)
            - Significant probability
               i. The significance of the relationship is expressed in probability levels
               ii. Tells how unlikely a given r value will occur given no relationship in the population
         2. Scatterplots
      iv. Flow chart – Opens discussion of how in-lake N & P levels may influence response variables and how those response variables, in turn, affect aquatic life

b. Questions and Comments

- Dave Kimmel: Given that the distribution of many water quality parameters have log-normal distributions one needs to be careful about calculating a Pearson product-moment correlation on data that have not been normalized.
- Mike O'Driscoll: Does DWR have any data before the sun rises, or are the data collected during the day? Answer: all data are collected during the day. DWR has no data on nutrient and chlorophyll-a concentrations after sunset and before sunrise – i.e. when photosynthesis is not occurring.
- Marcel Ardon: Regarding the duration curve for chlorophyll a distributions in Section 6, (Figure 3) - does the blue line based on all the data also include the data for the station YAD152C (the red line)? Answer: Yes the blue line includes data for all the stations, including station YAD152C. Station YAD152C was graphed because it is in the middle of the lake, it is a transition zone, high concentrations of chlorophyll a are observed here.
- Hans Paerl: TN and TP will be correlated with chlorophyll a, but the degree of correlation may depend on the importance of sediments in TN and TP measurements. The difference in the curve (Figure 3) may show this. Maybe it would be more appropriate to do the correlations at specific stations that reflect a high and low impact of sediments/sediment resuspension. Given relationships between nitrogen and chlorophyll a -nitrate may be more important when there is a lot fresh water input, whereas ammonium would be more important later in the summer; nitrogen fixation may play a role too. Correlations between chlorophyll and the different nitrogen species could be due to the energy required in using the different nitrogen sources.
- Nathan Hall: Beyond the negative correlation between nitrate and chlorophyll a -- the slope of the line is really close to what you expect from uptake of nitrate by phytoplankton and conversion to biomass. You can expect 1 µg/L of chlorophyll for every micromole of nitrate. Nitrate can be a major source of nitrogen. Bill Hall asks to which table is being referred to. Jing Lin answers, but it was not clear during the dialog which table/figure Nathan was referring to.

4. **Candidate Indicator List Review** (Carrie Ruhlman & Connie Brower)
   a. Introduced the Candidate Indicator Evaluation for High Rock Lake document
      i. Document lists each candidate indicator and attempts to summarize the feasibility and appropriateness of each for use in establishing water quality criteria for high HRL.
      ii. Categories include:
         1. Indicator

2. Clear link to beneficial use/support?
3. Scientifically sound, practical and reliable?
4. Data available?
5. Can build model to link to nutrients?

iii. Most categories filled in, but questions remain for some
iv. SAC members asked to review and fill in any missing information

5. **Homework – Conceptual Models & Ranges with Scientific Backing** (Carrie Ruhlman, Andy Sachs & Connie Brower)
   a. Homework assignment for SAC members:
      i. Draw conceptual models for candidate indicators
      ii. Each SAC member should select at least one indicator to work on
      iii. Determine ranges for each selected indicator
         1. Conduct literature search
         2. Identify relevant literature
         3. Use relevant literature to suggest scientifically defensible ranges for selected indicator(s)
      iv. Come to the December SAC meeting prepared to discuss:
         1. Your selected indicator(s)
         2. Relevant literature
         3. Suggested range for you indicator(s)
         4. Where the suggested range may be appropriately applied in HRL
      v. Indicator assignments:
         1. Chlorophyll-a – Bill, Hans
         2. Algal assemblages – Linda
         3. Dissolved oxygen – Dave, Marcelo
         4. pH – Clifton
         5. Toxins – Linda, Clifton
         6. Aesthetics - ???
         7. Quality of fishery & benthos - ???
         8. Water clarity – Mike

6. **Wrap-up** (Andy Sachs)
    a. Next meeting scheduled for December 9th, 2015.
7. **Attachments**

High Rock Lake Fisheries (WRC).pdf

HRL Data Correlation.pdf

Candidate Indicator Worksheet (draft).pd