Missouri Department of Natural Resources

**Memo to 303(d) Stakeholder Group**
**Sent 11/14/13**

We had a good public meeting yesterday to discuss the Proposed 2014 303(d) List and Proposed 2016 Listing Methodology Document. The Monitoring and Assessment Unit (MAU) wanted to provide a follow-up memo regarding the processes that were followed for selecting which RAM (Fish IBI) data used for listing/assessment purposes.

The MAU looked at the available data and discussed with MDC how to address various workgroup/stakeholder concerns regarding the data.

- We first took all of the samples in ONLY the Ozarks region that had poor scores and based upon best professional judgment from MDC Staff the sample was taken during normal representative conditions.
- Of those samples, samples taken in 1994 and 1995 as part of the nation-wide Re-MAP program were removed because these used a somewhat different protocol from the RAM Program.
- We then removed those samples that were either taken on (A) Losing streams as defined by the Department of Geology and Land Survey, or (B) Streams that were considered to have natural flow issues (such as substantial subsurface flow) preventing good scores from being obtained. (The latter was determined through best professional judgment of MDC Staff), (C) Removed first and second order streams.
- MDC was then asked to look at the habitat scores and to identify samples where habitat scores seemed to indicate potential habitat concerns. Matt Combes looked at many habitat parameters to determine a provisional threshold for good vs poor habitat. (See 4/29/13 Memo starting on Page 3 of this document)
- Samples with habitat scores below this threshold value and samples with no habitat scores where then eliminated from consideration.
- What remained were fish community samples from Ozark streams where samples were collected under normal conditions, where habitat seemed to be good, and where there were no issues with inadequate flow or water volume.

As a side note of yesterday's meeting, the MAU will be adding an appendix to our Listing Methodology Document outlining the procedures used above, and it will be updated when a more robust habitat index has been developed.

At the next public availability meeting, scheduled Wednesday 12/11/2013 – Lewis and Clark State Office Building – LaCharette Conference Room 10:00AM- 3:00PM, we welcome any additional comments, concerns, discussions on any of the information discussed in this memo, the proposed 2014 303(d) List, and the 2016 proposed Listing Methodology Document (LMD). For the 2016 LMD, the following is a list (not exclusive) of some of the issues/changes that have been proposed, which will plan to briefly discuss at the next public availability meeting. An updated version of the 2016 LMD will also be available on our website before the next meeting.

**Issues for 2016 LMD**

1. Expand Use of Binomial Probability : We propose to use the Excel function and worksheet Robert created to evaluate Type One error rates for even large sample sizes no limit?
2. Evaluating Fish IBI Scores: We propose to use the method recommended by Combes, McKee, Michaelson and Sarver during the considerations of the Biomonitoring Work Group. We also placed some language in the LMD about consultation with MDC on evaluation of habitat scores and other considerations when looking at streams with low IBI scores. Specifically, fish communities shouldn't be assessed with only IBI scores, they should have accompanying habitat scores and there should be no issues with water quality or flow/volume. Note the STL MDC status of habitat scoring as they previously did not collect habitat data (current status of habitat scoring not known).

3. Add Appendix for Fish IBI Scores: Added an appendix describing the process of using RAM data for listing/assessment purposes.
4. Clarification of sediment quotient calculation: Clarified this process. Calculate mean sediment concentration for all samples and then calculate a single quotient.
5. Correct table for sediment PEQ: In table B-1 it states 75% of PEQ, but it should be 150% of PEQ. And add PEQ to table B-2?
6. Appendix B – Statistical Considerations: For Bottom Deposits, added a foot note to describe statistical procedures for when data is non-normal. We currently use the Mann –Whitney test which is based on a comparison of medians rather than means.
7. Groundwater Protection for *E. coli*: Table B-1 and B-2 do not address groundwater protection for *E. coli*. Strictly compare 10% exceedance rate or use binomial probability?
8. Fish kills are an acute toxic event: There shall be no more than one acute or chronic event in the last 3 years of available data. Clarified that this includes documented fish kills but does not include fish kills of natural origin.
9. Table 1.1 and B-1: For Drinking water and other uses analyzed for toxic chemicals, Tables 1.1 and B-1 do not mesh well. Table 1.1 was updated to indicate that "water quality does not exceed standards as defined in Table B-1."
10. Table 1.2 – For Fish Community Data, Changed table so that it directly indicates data from first or second streams should not be assessed. Added footnote indicating IBI scores data from first or second order streams will not be assessed.
11. Weight of Evidence – Need to clarify the description for the *weight of evidence* approach. There may be instances of sediment toxicity, but fish and macroinvertebrate monitoring show normal communities. In such cases, the stream would be considered unimpaired using weight of evidence. This is only applies to instances where numeric criteria are not included in water quality standards. When numeric criteria are present in WQS, the weight of evidence approach is not used. Current wording is somewhat *confusing.* We added some provisional language for the weight of evidence approach to reflect usage of numeric thresholds for narrative criteria and importance of biological data, but welcome any suggestions.

**Memo to Bioassessment Workgroup**
**Sent 7/30/13**

At our last meeting discussing the 2014 Listing Methodology there were concerns about the methods proposed for assessing waters using the RAM program's fishes bioassessment data with regards to the use of a range of scores (for impaired vs suspected/inconclusive vs unimpaired) for 2014 and the proposal to use a single number to separate impaired from unimpaired streams in 2016. One of the main concerns with this change was the possibility of a large number of waters being listed in 2016.

Workgroup members asked DNR to solicit more input from MDC on interpretation of fish community and habitat data, and Phil Walsak specifically asked us to report on the number of streams that would be placed on the 303(d) list using our current scoring procedure for fish communities and the one we are proposing for the 2016 cycle.

Our unit has looked at the data available and has discussed with MDC how to address different concerns with the data. We first took all of the samples in the Ozarks region that had poor scores and had the best professional judgment from MDC Staff that the sample was taken during normal representative conditions. We then removed those samples taken in 1994 and 1995 as part of the nation-wide Re-MAP program because these used a somewhat different protocol from the RAM Program. We then removed those samples that were either taken on losing streams as defined by the Department of Geology and Land Survey or streams that were considered to have natural flow issues (such as substantial subsurface flow) preventing good scores from being obtained. (The latter was determined by best professional judgment of MDC Staff) We then asked for MDC to look at the habitat scores and try to identify those samples where habitat scores seemed to indicate potential habitat concerns. Matt Combes looked at the habitat parameters and determined a threshold for good vs poor habitat. We then eliminated from consideration, samples with habitat scores below this threshold value and samples with no habitat scores. What remained were fish community samples from streams where samples were collected under normal conditions, where habitat seemed to be good and where there were no issues with inadequate flow or water volume.

Using our current procedures two streams will be proposed to for the 303(d) list in 2014, Buffalo Cr. – WBID 3273 in Newton County and Woods Fk. WBID 2429 in Christian County. We then assessed these streams using the proposed 2016 cycle scoring method. This resulted in a total of three streams that would have been on the 303(d) list, the two previously noted and a portion of the upper Gasconade R. – WBID 1496 in Wright County.

The Department has also entered into a contract with the USGS Fish and Wildlife Coop at the University of Missouri to review all RAM data and make recommendations about how DNR should use habitat scores to assess fish community health.

Monitoring and Assessment Unit
Water Protection Program

**Memo From Matt Combes To MAU Staff**
**Sent 4/29/2013**

Trish and Robert;

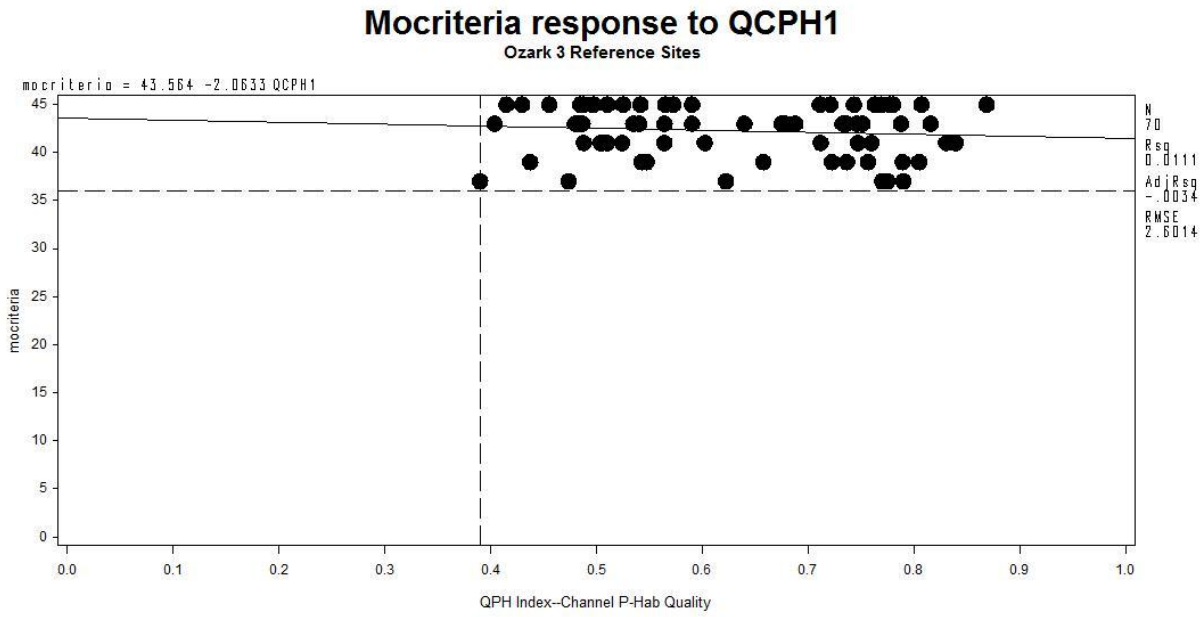
Section 4a in ***Evaluation of Biological Data in the DNR Listing Methodology Document***, starting on page 8, describes the agreed upon process for evaluating RAM fish community data for listing sites on the 2014 303(d) list. It states a need to evaluate habitat data to ensure that fish communities are not impaired due solely to poor habitat. It also states that DNR assessors will consult MDC staff, but that DNR assessors will make final decisions about which sites may be impaired due to habitat vs. other causes. This document is intended to describe what MDC sees as an objective means to use existing habitat data to evaluate sites with poor fish communities in a provisional way until a suitable habitat index is developed. Both agencies have engaged staff at University of Missouri-Columbia to initiate a series of projects that will result in a well-documented habitat index with thresholds that describe the effects of habitat on fish communities, and the products of that effort should be used when they become available instead of this provisional suggestion.
I spent a great deal of time last summer exploring the RAM dataset for a useful way to assess habitat in a provisional way. Based on that assessment, the QCPH1 index that is currently part of the RAM assessment protocol seems to be the best overall indicator of habitat condition. QCPH1 is composed of stream habitat metrics from in the channel only, and doesn't include any information from the riparian assessment. It is composed of the following 6 sub-metrics:
QSBX= Substrate Quality Metric
QCHADX= Channel Disturbance Metric
QVOLX= Channel Volume Metric
QCOMPX= Channel Spatial Complexity Metric
QCOVX= Fish Cover Metric
QVELOX= Tractive Force & Velocity Metric

For my assessment, I chose a set of 70 Ozark sites that were not impaired according to macroinvertebrate scores, the DNR's fish mocriteria score, and MDC's original fish IBI score.

Mocriteria > 36.0
IBI6 > 75.0
MSCI > 16.0

Then I plotted the QCPH1 value for each site to identify the lowest boundary QCPH1 score that captured all sites. The boundary identified was a QCPH1 score of 0.39. (see plot below)

Ignore the regression line, it is meaningless.




Using this approach, impaired fish communities with a QCPH1 score of <0.39 could be placed into Category 3b rather than Category 5 since there is evidence of poor habitat. If the RAM site did not have a QCPH1 score (inadequate data) and the fish community had an impaired score, these also could be put into Category 3b. I have attributed the attached spreadsheet with QCHP1 scores for each site, or indicated those without scores. This approach applies to assessing a single site's fish community integrity in light of habitat quality. DNR will still need to come up with a way to assess habitat at the WBID scale. I propose you follow the work group recommendation:

*Work Group Recommendation: When fish IBI scores indicate waterbody impairment as determined by the LMD rules, DNR assessment staff will consult with MDC on the habitat scores associated with these samples. Based on the results of this consultation, if DNR concludes that:*

*- the majority of the low scores also have physical habitat scores that are suspect but do not clearly indicate either good habitat or poor habitat, the fish community will be assessed as "suspect" and in the absence of other data indicating impairment, the water body will be placed in category 2B or 3B.*

*- the majority of the low scores have physical habitat scores that indicate poor habitat condition, the fish community will be assessed as impaired by habitat and in the absence of other data requiring 303(d) listing, the water body would be placed in category 4C.*

*- the majority of the low scores have physical habitat scores that indicate good habitat condition, the water body will be assessed as having a fish community impaired by a stressor other than habitat and placed in category 5, the state 303(d) List unless a TMDL that addresses these stressors has been approved, in which case, the water body will be placed in category 4A.*

Streams Used For Provisional Habitat Threshold:

| Stream Name | Uniq_id | seg_id | County | UTM_X | UTM_Y | Year | QCPH1 | MOCriteria (IBI Score) |
|---|---|---|---|---|---|---|---|---|
| LITTLE MONITEAU CREEK | MO2-261-08 | 103001023653 | Moniteau | 548794 | 4281323 | 2008 | 0.390 | 37 |
| BEAVER CREEK | 23421-08 | 102902036849 | Phelps | 606128 | 4193058 | 2008 | 0.404 | 43 |
| DEER CREEK | LO1-271-08 | 102901097435 | Benton | 486045 | 4222176 | 2008 | 0.415 | 45 |
| HILLERS CR. | 20951-04 | 103001023716 | Callaway | 584545 | 4281782 | 2004 | 0.438 | 39 |
| BEAVER CREEK | 23411-08 | 102902036803 | Phelps | 602494 | 4194766 | 2008 | 0.456 | 45 |
| BIG PINEY RIVER | 23571-08 | 102902025084 | Texas | 583001 | 4112290 | 2008 | 0.468 | 45 |
| FIVE MILE CREEK | 22721-06 | 110702073594 | Newton | 360305 | 4091536 | 2006 | 0.474 | 37 |
| FLAT CREEK | 22311-05 | 110100021754 | Barry | 428509 | 4071314 | 2005 | 0.480 | 43 |
| HUNTER CREEK | 22171-05 | 11010006651 | Douglas | 535420 | 4088647 | 2005 | 0.483 | 43 |
| INDIAN CREEK | R068-06 | 110702084428 | McDonald | 378220 | 4064867 | 2006 | 0.485 | 45 |
| BIG PINEY RIVER | 23461-08 | 102902024717 | Texas | 590373 | 4135503 | 2008 | 0.487 | 43 |
| NORTH FORK SPRING RIVER | 22941-06 | 110702071828 | Jasper | 378693 | 4128278 | 2006 | 0.488 | 41 |
| MERAMEC RIVER | R0613-06 | 71401024283 | Dent | 637890 | 4179256 | 2006 | 0.488 | 45 |
| FINLEY CREEK | 22221-05 | 11010002891 | Christian | 483787 | 4099888 | 2005 | 0.497 | 45 |
| WEST PINEY CREEK | 23521-08 | 102902024819 | Texas | 585608 | 4129643 | 2008 | 0.498 | 45 |
| STRAIGHT FK. | 20811-04 | 103001024494 | Moniteau | 520839 | 4268711 | 2004 | 0.504 | 41 |
| N. FORK SPRING RIVER | 22641-06 | 110702071942 | Jasper | 370394 | 4125392 | 2006 | 0.506 | 41 |
| UNNAMED FRK S. PRG. JACKS FRK | 21231-04 | 110100081882 | Texas | 596922 | 4106206 | 2004 | 0.510 | 41 |
| INDIAN CREEK | 22811-06 | 110702084470 | McDonald | 377193 | 4062938 | 2006 | 0.511 | 45 |
| CLEAR CREEK | 22691-06 | 110702073757 | Newton | 399469 | 4088401 | 2006 | 0.524 | 41 |
| WEST PINEY R. | RES051-05 | 102902024819 | Texas | 585830 | 4129784 | 2005 | 0.525 | 45 |
| N. PRONG LITTLE BLK R | 21331-04 | 110100082885 | Carter | 695140 | 4078293 | 2004 | 0.537 | 43 |
| NOBLETT CREEK | 22191-05 | 11010006733 | Howell | 580881 | 4086421 | 2005 | 0.541 | 43 |
| BENNETTS BAYOU | 22361- | 11010006 | Howell | 582995 | 4046846 | 2005 | 0.542 | 45 |

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| | 05 | 1914 | | | | | | |
| BURRIS FORK | 20141-03 | 103001024799 | Moniteau | 534719 | 4263052 | 2003 | 0.543 | 39 |
| W. FRK BLACK R. | 21171-04 | 110100074327 | Reynolds | 662508 | 4153054 | 2004 | 0.548 | 39 |
| LONG CREEK | 22471-05 | 110100036902 | Taney | 504187 | 4060284 | 2005 | 0.564 | 41 |
| BENNETTS BAYOU | 22351-05 | 110100061901 | Howell | 583241 | 4047151 | 2005 | 0.565 | 43 |
| JONES CREEK | 22841-06 | 110702072824 | Jasper | 385811 | 4105891 | 2006 | 0.565 | 45 |
| WHETSTONE CREEK | 23551-08 | 102902013292 | Wright | 554928 | 4120491 | 2008 | 0.573 | 45 |
| LICK CREEK | 22381-05 | 110100061995 | Ozark | 555455 | 4043951 | 2005 | 0.573 | 45 |
| BEAVER CREEK | 23561-08 | 102902013252 | Wright | 566060 | 4121636 | 2008 | 0.591 | 45 |
| INDIAN CREEK | 22871-06 | 110702084673 | McDonald | 370882 | 4056854 | 2006 | 0.591 | 43 |
| MERAMAC RIVER | 95201-02 | 71401023195 | Crawford | 629552 | 4202125 | 2002 | 0.603 | 41 |
| POND FORK | 22481-05 | 110100037099 | Ozark | 528489 | 4056635 | 2005 | 0.623 | 37 |
| COURTOIS CREEK | 99051-02 | 71401022827 | Crawford | 658457 | 4209905 | 2002 | 0.640 | 43 |
| BENNETTS BAYOU | 22341-05 | 110100061894 | Howell | 583834 | 4047639 | 2005 | 0.658 | 39 |
| ELK CREEK | 23331-08 | 102902025029 | Texas | 589279 | 4116215 | 2008 | 0.675 | 43 |
| ELK RIVER | ER1-06 | 110702084859 | McDonald | 375359 | 4050063 | 2006 | 0.679 | 43 |
| INDIAN CREEK | 22701-06 | 110702084419 | McDonald | 379652 | 4065730 | 2006 | 0.688 | 43 |
| BEAR CREEK | 22441-05 | 110100036472 | Taney | 480407 | 4068760 | 2005 | 0.711 | 45 |
| CROOKED CR. | RES071-05 | 71401024390 | Dent | 646503 | 4177847 | 2005 | 0.712 | 41 |
| ELK CREEK | 23321-08 | 102902025042 | Texas | 590407 | 4115722 | 2008 | 0.721 | 45 |
| LITTLE CREEK | 23471-08 | 102902013153 | Wright | 536494 | 4125492 | 2008 | 0.723 | 39 |
| INDIAN CREEK | R067-06 | 110702084405 | McDonald | 380080 | 4065812 | 2006 | 0.733 | 43 |
| ELK CREEK | 23541-08 | 102902012307 | Wright | 548866 | 4145282 | 2008 | 0.736 | 43 |
| PINE CREEK | 22291-05 | 110100061655 | Ozark | 560820 | 4057824 | 2005 | 0.737 | 43 |
| SPRING CREEK | 22301-05 | 110100061673 | Ozark | 572433 | 4057733 | 2005 | 0.737 | 39 |
| W. FRK. SPRING RIVER | 21191-04 | 1101001010617 | Howell | 599896 | 4045579 | 2004 | 0.739 | 45 |
| ROUBIDOUX CREEK | 23431- | 10290201 | Texas | 575387 | 4142259 | 2008 | 0.746 | 43 |

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| | 08 | 2438 | | | | | | |
| BEAVER CREEK | 23441-08 | 102902036868 | Phelps | 606819 | 4192107 | 2008 | 0.747 | 41 |
| MERAMAC RIVER | 20171-02 | 71401024283 | Dent | 635969 | 4180819 | 2002 | 0.752 | 43 |
| CLARK CREEK | 23501-08 | 102902013205 | Wright | 551041 | 4123844 | 2008 | 0.757 | 39 |
| INDIAN CREEK | 22181-05 | 11010006658 | Douglas | 576568 | 4091933 | 2005 | 0.760 | 41 |
| NORTH FORK SPRING RIVER | 22631-06 | 110702071941 | Jasper | 369545 | 4126686 | 2006 | 0.760 | 41 |
| BIG PINEY RIVER | 95211-02 | 102902024890 | Texas | 586719 | 4125067 | 2002 | 0.763 | 45 |
| BUFFALO CR | 21301-04 | 110100083200 | Ripley | 682763 | 4066880 | 2004 | 0.769 | 45 |
| MID. FRK. BLACK R. | 21081-04 | 110100074058 | Iron | 680343 | 4163800 | 2004 | 0.770 | 37 |
| LITTLE SUGAR CREEK | 22901-06 | 110702084929 | McDonald | 380715 | 4047699 | 2006 | 0.775 | 37 |
| PINE CR | 21121-04 | 110100082145 | Texas | 598989 | 4101378 | 2004 | 0.780 | 45 |
| MILL CREEK | 21251-04 | 110100118408 | Oregon | 659475 | 4040992 | 2004 | 0.783 | 45 |
| BIG SUGAR CREEK | 22911-06 | 110702084784 | McDonald | 379122 | 4052576 | 2006 | 0.788 | 43 |
| RIPPEE CREEK | 22241-05 | 11010006940 | Douglas | 545895 | 4080107 | 2005 | 0.790 | 39 |
| OTTERY CR | 21111-04 | 110100074000 | Iron | 684470 | 4167482 | 2004 | 0.791 | 37 |
| SINKING CR | 21261-04 | 11010008446 | Shannon | 649858 | 4142135 | 2004 | 0.805 | 39 |
| HICKORY CREEK | R064-06 | 110702073973 | Newton | 379154 | 4080880 | 2006 | 0.807 | 45 |
| CENTER CREEK | 22861-06 | 110702072317 | Jasper | 372633 | 4115592 | 2006 | 0.816 | 43 |
| BIG SUGAR CREEK | 22741-06 | 110702084995 | McDonald | 399394 | 4046589 | 2006 | 0.831 | 41 |
| INDIAN CREEK | 22681-06 | 110702084523 | McDonald | 376736 | 4061013 | 2006 | 0.840 | 41 |
| S. FRK. BUFFALO CR | 21141-04 | 110100083263 | Ripley | 679297 | 4064627 | 2004 | 0.869 | 45 |
| WEST FORK SPRING RIVER. | RES011-05 | 11010010 10617 | Howell | 599929 | 4045966 | 2005 | | 45 |