**Identifying the correct natural community – Thermal Regime***Fish Communities Found*

1. **Two or More Classifications May Fit:** What to do when the verification procedure indicates that the modeled NC is incorrect but there is more than one new NC that fits the verification data.

[for example, a site classified from the model as coldwater might have 10% coldwater, 90% transitional, and 0% warmwater fish individuals, which would indicate that it was misclassified **(coldwater thermal criteria: 25-100% coldwater; 0-75% transitional; 0-5% warmwater individuals**)]

To evaluate, check the following:

\_\_\_\_ Evidence of environmental degradation from the fish data

* Specify fish data indicators that would illustrate degradation

\_\_\_\_ Sample was NOT from an extreme weather period.

* Specify the thresholds for extreme weather conditions?

With these observed fish percentages the site could be **legitimately reclassified** as either

* cool-cold (0-75% coldwater; 25-100% transitional; 0-25% warmwater) or
* cool-warm (0-25% coldwater; 25-100% transitional; 0-75% warmwater).

[Additionally, if the site had 46% small-stream, 46% medium-stream, and 8% large-river individuals, it could be classified as either a headwater (50-100% small-stream; 0-50% medium-stream; 0-10% large-river) or a mainstem (0-50% small-stream; 50-100% medium-stream; 0-50% large-river). So, four new NC’s would be possible: CC\_HW, CC\_MN, CW\_HW, or CW\_MN. What to do?]

For cases where more than one new **thermal** class matches the fish data, **pick the new thermal class closest to the original modeled thermal class**.

So in the above example, since the site was originally modeled as coldwater, the new classification would be **cool-cold**, which is closer to coldwater than is cool-warm. If the original model classification had been warmwater then the closest class would be cool-warm. Based on the thermal criteria and my math, if the modeled thermal class is either cool-cold or cool-warm then there will never be more than one new thermal class that will fit the fish data. So the issue of **multiple possible new thermal classes will only arise for sites originally modeled as Coldwater or Warmwater.**

**C**oldwater 🡪 cool-cold
Warmwater 🡪 cool-warm

1. **Cases where Fish Data don’t match Modeled Thermal NC**

In a few circumstances you might have **fish data that don’t completely match the modeled thermal NC,** but which fit alternative thermal NC’s even worse.

* Do not change the modeled thermal NC.

For example, a site might be modeled as warmwater (0-5% coldwater; 0-25% transitional; 75-100% warmwater) and actually have 10% coldwater, 10% transitional, and 80% warmwater fish individuals. It would thus exceed the warmwater classification thermal threshold for coldwater individuals (<5%). But for the cool-warm and cool-cold thermal classifications it would miss the thresholds for both transitional (>25%) and warmwater individuals (either < 25% or <75%), making for an even worse fit, so I’d leave it classified as warmwater.

1. **For the stream-size classification**

There may be more than one possible new stream-size classification only if a site is originally modeled as coldwater, which has no stream-size classification, and needs to be changed to a warmer thermal class, in which case a stream-size classification is required.

Note: Do we need to acknowledge somehow that the coldwater NC comes in two sizes in order to assess these potential impacts?

So returning to the first example above, the fish data indicate that the site could be classified as either a headwater or a mainstem. There’s no modeled stream-size classification to start with, so there’s no “closest” new classification and no fish-basedreason to select one new stream-size classification over the other.

**Use the modeled annual 90% exceedence flow value to determine the stream-size classification**. This is the variable used to designate the modeled stream-size for cool-cold, cool-warm, and warmwater sites. Although this flow value is not used to classify sites that are modeled as coldwater, it is nonetheless available for these sites.

\_\_\_\_\_ If the modeled flow is less than 3.0 ft3/s then the site should be classified as a headwater,

\_\_\_\_\_if it is 3.0-150 ft3/s it should be classified as a mainstem, and

\_\_\_\_\_if it is more than 150 ft3/s it should be classified as a large river.

**Identifying the correct spatial extent of the updated natural community**

1. Second, there’s the question of how far upstream or downstream from the actual fish survey area the verification results should apply.

evaluating groundwater withdraws. For example, I just conducted a field visit for a proposed high cap well that could remove 26% of flow from this small headwater stream (it has a modeled Aug 50 flow of 0.54 cfs). The modeled NC is cool cold headwater so according to Michigan model they could remove 4% of flow. Based on the fact the modeled NC is cool cold headwater we can deny this well. However if we completed a fish survey, I suspect the fish data would indicated the NC is coldwater and the Michigan Model would allow for a 20% flow reduction. I think 20% of .54 cfs is significant. So my question is, Do we need to acknowledge somehow that the coldwater NC comes in two sizes in order to assess these potential impacts? Maybe use the fish data to verify its coldwater and then use the 90% exceedence flow you described above to indicate the stream is small or large? John if I’m not making sense let me know.

For the second issue, the question is whether to limit the verification process to just the area actually sampled for fish or to extend it beyond the sampled area based on objective criteria. The simplest and most easily defended approach is to consider as verified only those stream reaches (= HydroID in WDNR hydro layer) from which fish are actually collected and analyzed. But this means that the vast majority of stream reaches will never be verified. There are probably more than 100,000 HydroID’s, each with their own modeled NC, and although some sampling stations may encompass more than one HydroID, the combined stream fish sampling by all WDNR entities probably averages no more than 500-1000 HydroID’s per year (i.e., <1%). Furthermore, there will end up being many places where a short reach with a verified NC of one type will be embedded in a much long piece of stream with a different and unverified type of NC. This pattern could be problematic for 305b reporting, 303d listing, and permit reviews.

An alternative approach would be to extend the verified NC upstream and/or downstream to encompass a longer and more ecologically relevant piece of stream. The problem here is how to determine how far to go. A simple approach would be to consider as verified (and to change the NC if applicable) all contiguous segments that had the same modeled NC classification as the sampled site. But this could be tough to defend for long pieces of stream in which you could be extrapolating many miles beyond the actually sampling site. And what would you do if you had multiple sampling sites with different NC’s within that long stream piece?

What I recommend is extending the verified NC beyond the boundaries of the sampled site, but limiting the extension based on hydrological features such as lakes and impoundments, dams, and tributary confluences. These hydrological features will be likely to influence the flow and temperature of the stream, and extrapolating past them could be risky. So if you sample a site for fish and then verify (changing if necessary) the NC, the “verified” NC status should be extended upstream and downstream to the first lake/impoundment, dam, or tributary confluence encountered or to the stream reach where the modeled NC is different from the verified NC, whichever comes first. This approach will mean that verified NC’s will not be extended particularly far in well-developed drainages with lots of tributaries, such as in the Driftless Area, or in areas of the state with lots of lakes, but could be extended fairly long distances in flat landscapes with low stream density, a distinction that seems reasonable to me.

So that’s issue number two, which I hope is clear. Again, let me know your thoughts. Yeah I wondered how to conduct this reach analysis. I think what you proposed is reasonable but most of my streams contain many many tributary confluences. Can we include some caveats like 1) we can ignore tributaries between samples sites if fish data indicates the same NC 2) Can we ignore dryrun and 1st or 2nd order intermittent tributaries for example. Just some suggestions.

Have a good weekend.

John