WisCALM 2022 – Wadeable fIBI Assessment Parameter Documentation

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A product of the State of Wisconsin Clean Water Act Water Quality Report to Congress

Red Cedar River, Wisconsin DNR

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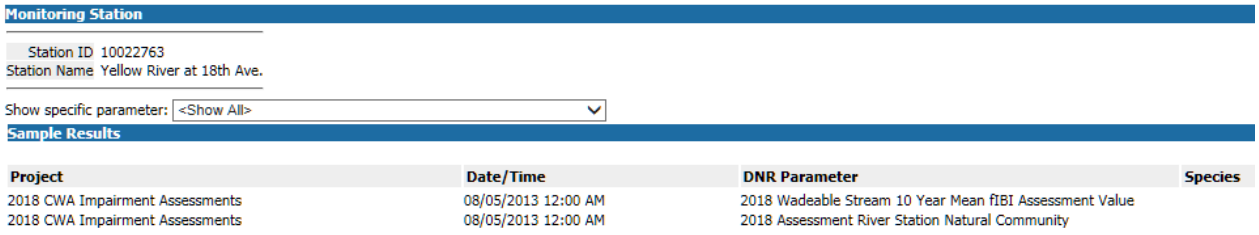
Contents

Parameter Name and Number 2
Description 2
Data Sources and Storage 2
Data Entry 3
Natural Community Confirmation and Fish IBI Package Work 4
Presentation of Fish IBI Data 5
Presentation and review by biologists 5
Quality control of information (factors, variables) 6
Update of WATERS database and natural community module and update of package. 6
Data entry back into the system 6
Presentation of Results 6
Assessment Package Logic 7
Assessment Package Code 12
Spatial Analysis of Fisheries IBI Station 14
Getting the data: 14
Preparing the data 14
Joining the Data Layers 15

Parameter Name and Number


Monitoring Station

Station ID 10022763
Station Name Yellow River at 18th Ave.

Show specific parameter: <Show All>

Sample Results

Project	Date/Time	DNR Parameter	Species
2018 CWA Impairment Assessments	08/05/2013 12:00 AM	2018 Wadeable Stream 10 Year Mean fIBI Assessment Value	
2018 CWA Impairment Assessments	08/05/2013 12:00 AM	2018 Assessment River Station Natural Community	

Description

Biological indicator based on data collected from two or more sampling visits for a particular assessment unit (i.e. stream segment) are considered sufficient data to assess attainment of the narrative biological standards. The general condition category threshold for "poor" condition is used as the benchmark for evaluating attainment of WQS.

Data Sources and Storage

Source of data (where collected, by whom)

- DNR's Fisheries Management Database (FMDB)
- SWIMS station

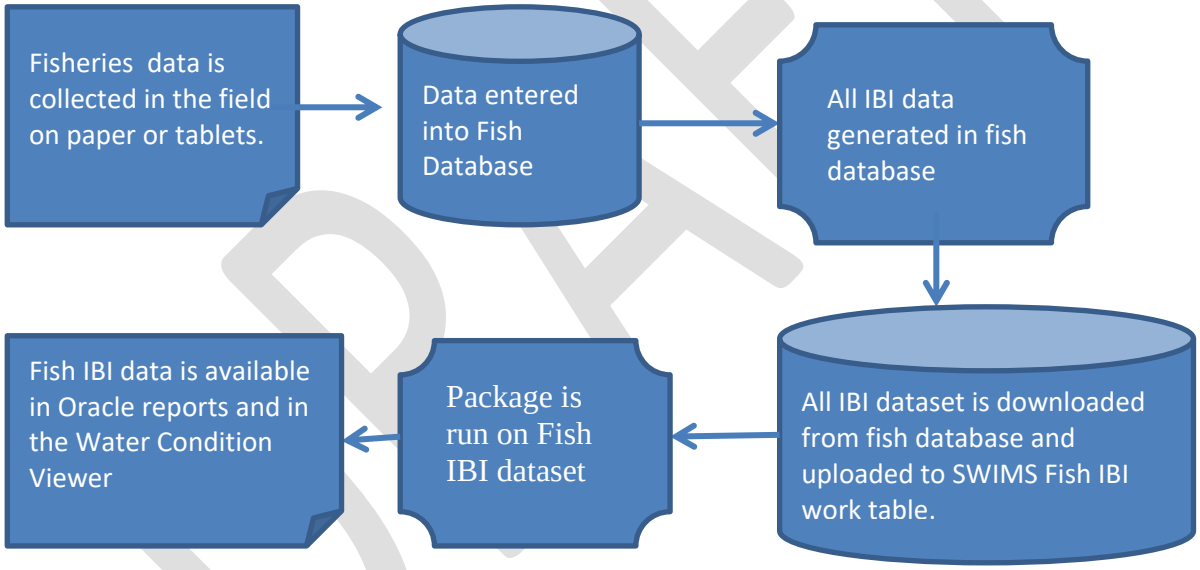
- AU/MS – station intersection – SDE, python script
- WATERS Natural Community Modeled Data Validation Decision & Support documentation
- W07510 and w23321 schemas for data tables
- Oracle package – generated datasets displayed online (Water Condition Viewer)
- Oracle reports in WATERS by assessment unit

Methods and procedures to document and store

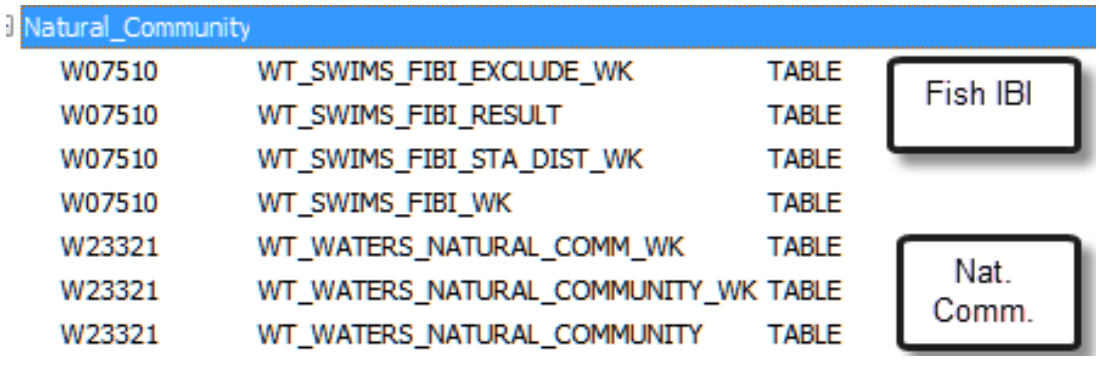
- Guidelines for Assessing Fish Communities of Wadeable Streams in Wisconsin
- Draft procedures for verifying natural community model determinations for Wisconsin rivers and streams.

Data Entry

DNR staff (fisheries or water quality) enter fish taxonomy count data from surveys into the Fisheries database. This database stores all taxonomic count data and has a function to create what is called an "All IBI" dataset, which provides an IBI value for each complete and proofed survey in the system. This data is then downloaded to the SWIMS system worktables.

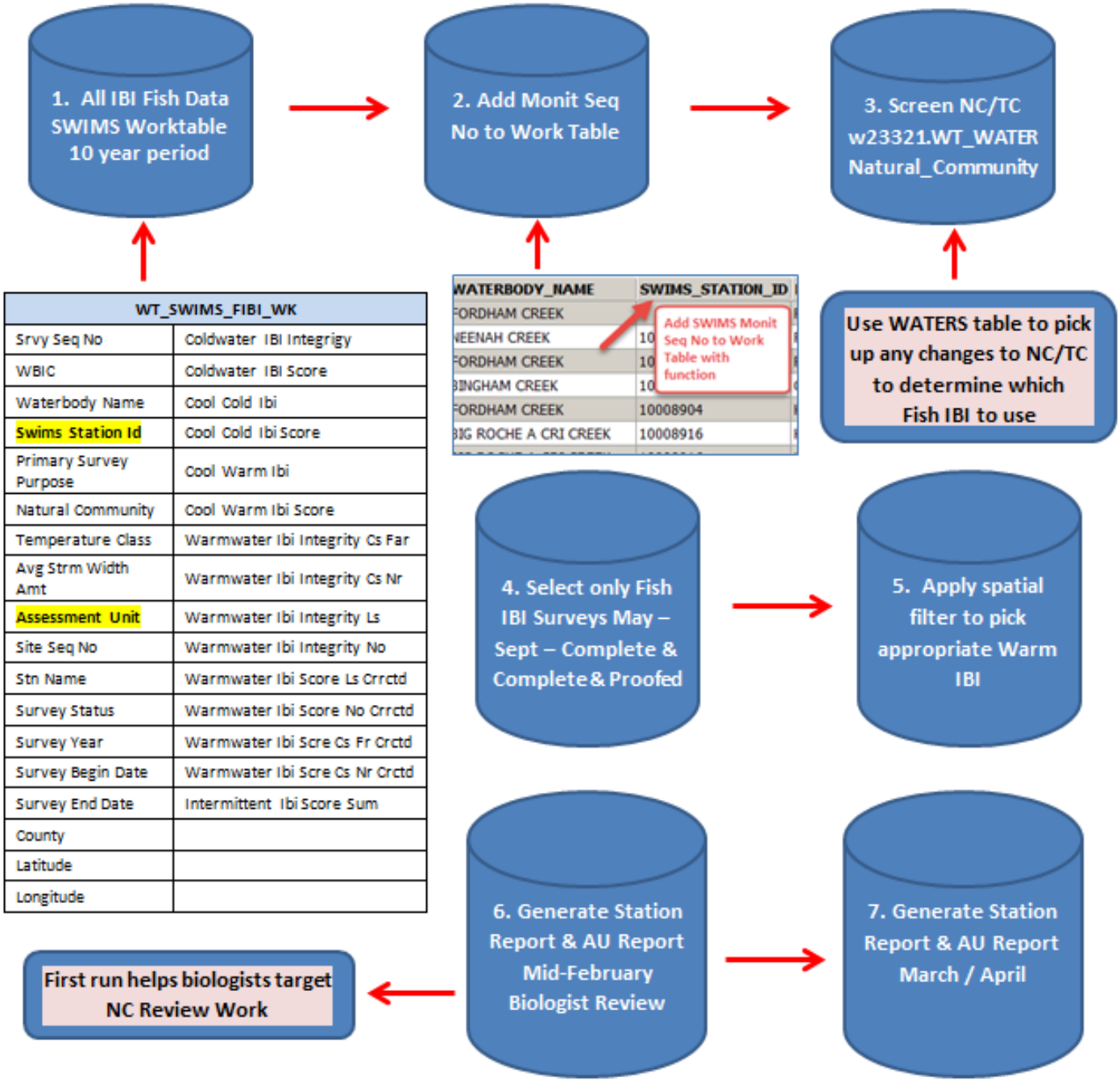


The fish IBI package reviews list of surveys to be excluded based on survey type and "results". Package checks WATERS to see if Natural Community is determined by fish biologist (Model is confirmed, NC is changed / approved, or "needs review"). If the NC module in WATERS does not have the survey sequence number, the package uses the original model data, which is stored with the all IBI data in the work table.



Natural Community Confirmation and Fish IBI Package Work

The steps below show the process of implementing the natural community confirmation process and how that process is linked to the Fish IBI tool and data display in the water condition viewer in SWIMS.



WT_SWIMS_FIBI_WK	
Srvy Seq No	Coldwater IBI Integrigy
WBIC	Coldwater IBI Score
Waterbody Name	Cool Cold Ibi
Swims Station Id	Cool Cold Ibi Score
Primary Survey Purpose	Cool Warm Ibi
Natural Community	Cool Warm Ibi Score
Temperature Class	Warmwater Ibi Integrity Cs Far
Avg Strm Width Amt	Warmwater Ibi Integrity Cs Nr
Assessment Unit	Warmwater Ibi Integrity Ls
Site Seq No	Warmwater Ibi Integrity No
Stn Name	Warmwater Ibi Score Ls Crrctd
Survey Status	Warmwater Ibi Score No Crrctd
Survey Year	Warmwater Ibi Scre Cs Fr Crctd
Survey Begin Date	Warmwater Ibi Scre Cs Nr Crctd
Survey End Date	Intermittent Ibi Score Sum
County	
Latitude	
Longitude	

Presentation of Fish IBI Data

Presentation and review by biologists

The Fish IBI results from the Fish IBI package, combined with functions carried out in the WATERS system, are available through the WATERS database via an oracle report (see below) which indicates the natural community used and whether the NC survey results "need review" (*) or whether the NC from the fish database was used (this is the original modeled NC) and indicates that no waters validation survey data was available for review.

Fish IBI Assessment Report (WisCALM) **Includes data from 2007 to 2016** **Date Report Ran: 10/24/2017**

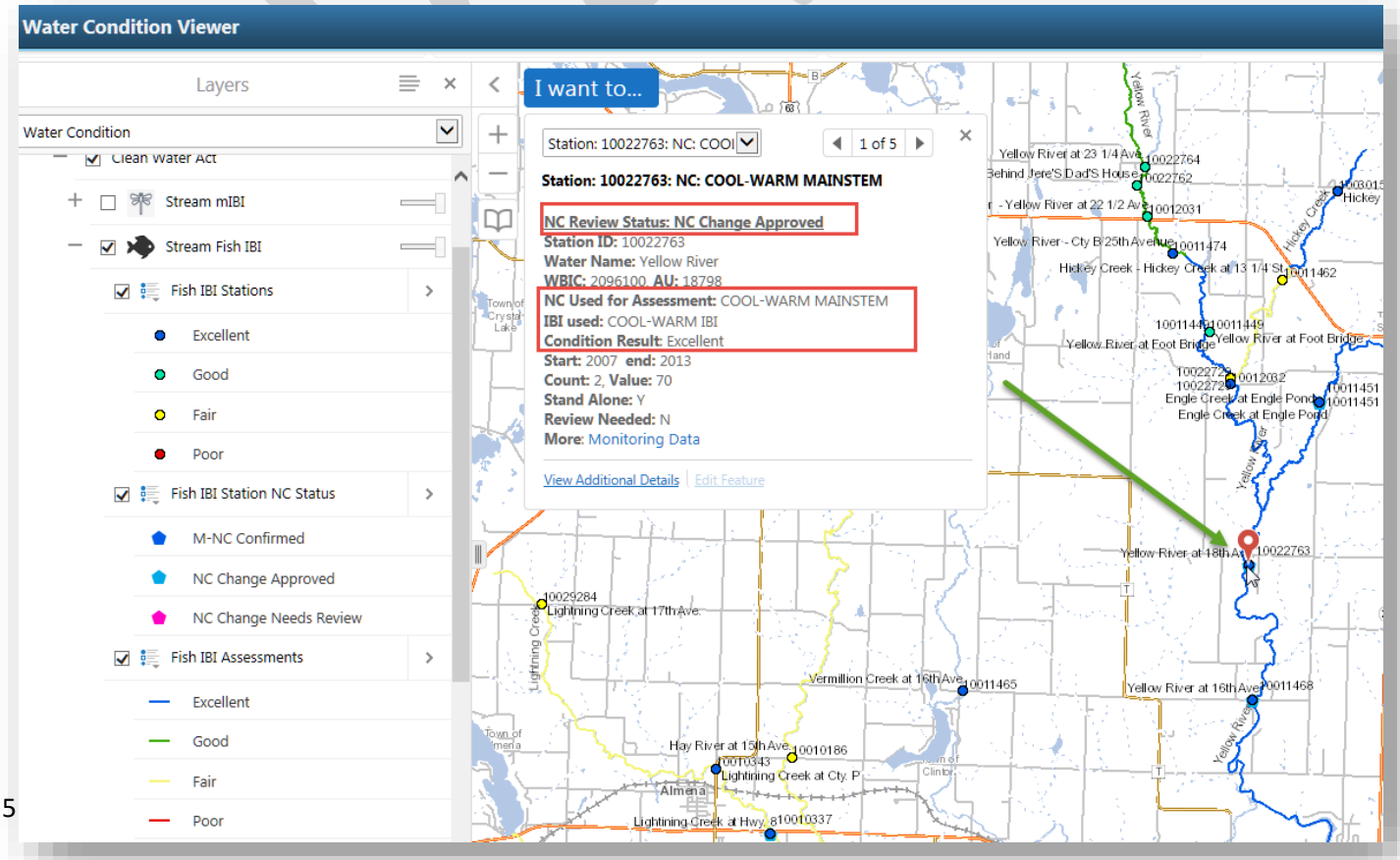
WBIC: 282100 **Official Name:** South Fork Blake Creek **AU #:** 10340 **Mile:** 0 to 1
County: Waupaca **Watershed:** Lower Little Wolf River
Natural Community: Cool-Cold Headwater* **Condition:** Good
Station Used: 10013573 South Fork Blake Creek - Hwy E (Upstream)

Station ID	Name	Earliest Survey	Latest Survey	IBI	# Surveys	Mean Score	Natural Community	Stand Alone?	Condition
10013573	South Fork Blake Creek - Hwy E (Upstream)	07/26/2010	07/07/2015	Intermittent	2	70	Cool-Cold Headwater*	Y	Good

WBIC: 283100 **Official Name:** Shaw Creek **AU #:** 10342 **Mile:** 0 to 7.95
County: Waupaca **Watershed:** Lower Little Wolf River
Natural Community: Cool-Warm Headwater* **Condition:** Poor
Station Used: 693131 Shaw Creek at Cth O

Station ID	Name	Earliest Survey	Latest Survey	IBI	# Surveys	Mean Score	Natural Community	Stand Alone?	Condition
693131	Shaw Creek at Cth O	07/21/2015	07/21/2015	Intermittent	1	20	Cool-Warm Headwater*	N	Poor
10022184	Shaw Creek At Cth O (East Crossing)	07/31/2007	07/31/2007	Intermittent	1	20	Cool-Warm Headwater	N	Poor

* - Natural Community Needs Review ** - Natural Community From Fish Survey Was Used



Quality control of information (factors, variables)

Fish data is screened in multiple areas:

- The survey must be complete and proofed in when in the Fish Management Database
- After survey data is uploaded in **WT_SWIMS_FIBI_WK** table, it is screened to ensure that it should not be excluded (based on survey type or too few fish collected).
- The survey location modeled natural community is reviewed through protocols that double check the model outcome (stream width/size, (swims station/assessment unit)

Update of WATERS database and natural community module and update of package.

Once the data is loaded into the fish IBI tables and the package is run, water quality biologists review the fish IBI data at stations in their work area to identify if the modeled natural community should be confirmed or changed. If the natural community was changed in prior assessment periods, the fish IBI data will reflect that change. If not and the natural community dataset indicates that the station "needs review", the biologist will look closely at the dataset using the draft guidance for

- The biologist can find this data in a number of ways. First, through the consolidated assessment materials provided by the Water Evaluation Section through the integrated reporting process.
- The biologist may also see this data when they provide summary write-ups of their monitoring projects whether that is a short two-page write-up or a detailed Water Quality Management Plan.
- The biologist can find the data on the Water Condition Viewer (as the map view on the previous page indicates, each survey will have an accompanying natural community point that indicates the" status" of the natural community determination), as well as through a report generated in the WATERS system by county, watershed or by single assessment unit.
- The biologist is also copied on the natural community results when they are loaded into the NC Work Table and are provided a link to the WATERS record to review the data.

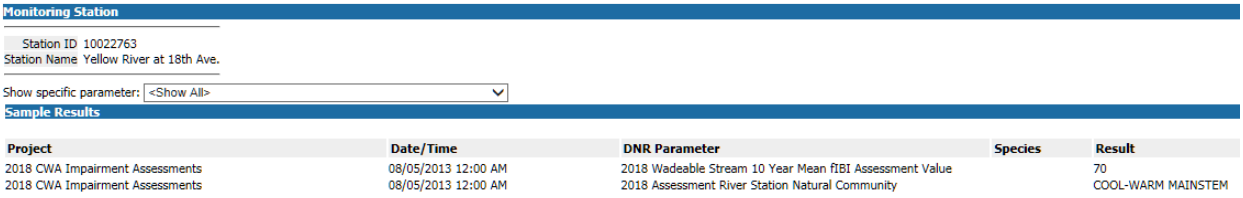
Data entry back into the system

During the multi-parameter assessment process, the biological data may be used to confirm an existing listing for total phosphorus providing the biological confirmation needed to move the water from 5P (phosphorus only exceeding water quality standards) to 5A, a water listed for total phosphorus and a degraded biological community based on the condition data from the fish IBI package and natural community confirmation or update information. All fish IBI data is based on the natural community model unless reviewed and changed by the water quality biologist.

Presentation of Results

The fish IBI is used in the multi-parameter assessment process for the Fish and Aquatic Life designated use assessment as a stand-alone parameter or as one of several in the multiple parameter assessment during the integrated reporting process as well as during the update of water quality management plans or monitoring report write-ups. The Fish IBI may be assessed independently from other parameters and may affect the waterbody assessment categorization for the FAL use assessments.

Summary assessments are displayed as parameters on the station in the SWDV and the WCV.



Monitoring Station

Station ID 10022763
Station Name Yellow River at 18th Ave.

Show specific parameter: <Show All>

Sample Results

Project	Date/Time	DNR Parameter	Species	Result
2018 CWA Impairment Assessments	08/05/2013 12:00 AM	2018 Wadeable Stream 10 Year Mean fIBI Assessment Value		70
2018 CWA Impairment Assessments	08/05/2013 12:00 AM	2018 Assessment River Station Natural Community		COOL-WARM MAINSTEM

Assessment Package Logic

Prepared by: Ashley Beranek, Lisa Helmuth, Brian Tinberg
August 9, 2017

1) Download all fish IBI data for the past 10 years
    a. **Download the all fish IBI (fIBI) data** with "SRVY_BEGIN_DATE" of (previous 10 years) 2007 – 2016
        i. Make sure all surveys are proofed and complete.
            1. If surveys are not proofed and complete, communication with the regional biologist is needed to determine if surveys can be finalized
                a. Regional or CO staff will update surveys in the Fisheries Management Database (FMDB).
            2. Re-run the All IBI dataset in the fish database after biologists have changed the status to proofed and complete and load into wt_SWIMS_fIBI_wk.
        ii. Review and screen survey duplicates in the work table.
            1. Exclude duplicates by running a compare in TOAD and deleting data that is not already entered. Duplicates are determined by running a compare on duplicate survey_seq_nos.
            2. One should be cognizant to ensure that the data is completely duplicative. Exclude those surveys that already reside in the work table.
    b. Migrate updated fIBI survey values into SWIMS
        i. Load new fIBI data into SWIMS worktables
            1. fIBI data from USGS / WDNR FDB gets loaded into w07510.wt_swims_fibi_wk
            2. A second table, w07510.wt_swims_fibi_exclude_wk, containing additional fields which allow us to exclude surveys, is also loaded with the same data

2) Warm IBI region and distance to lake gets loaded into w07510. wt_swims_fibi_sta_dist_wk
    a. fIBI scores of certain streams are influenced by proximity to lakes

3) The FIBI package, w07510.pk_swims_fibi, gets run. It populates wt_swims_fibi_result*, only taking data from wt_swims_fibi_wk where:
    a. survey_status = 'DATA ENTRY COMPLETE AND PROOFED'
    b. the survey_begin_date is between May and September
    c. the survey_begin_date is within the specified 10-year range (currently 1/1/2007 – 12/31/2016)
    d. there is **not** a record in w07510.wt_swims_fibi_exclude_wk for the same srvy_seq_no where the calculation_status is not OK or the result values indicate “Too few fish”:

* Table w07510.wt_swims_fibi_result has been created to hold the results of the package run. It’s similar to the raw data table w07510.wt_swims_fibi_wk

4) The package populates the AU (assessment_unit_seq_no) in w07510.wt_swims_fibi_result.
    a. In cases where the station is intersected with multiple AUs, the station and survey will be repeated for each intersected AU.

5) The package populates the natural community (natural_community_seq_no) in w07510.wt_swims_fibi_result. This comes from the WATERS table w23321.wt_waters_natural_community for the record with the most recent request_date for records matching the monit_station_seq_no.
    a. No other conditions are applied (i.e. no check of request type or status), simply grab the most recent record for the station; someone should verify that is correct.

6) The package pulls along the modeled natural community from the survey result itself (w07510.wt_swims_fibi_wk.natural_community), putting it in w07510.wt_swims_fibi_result.survey_natural_community_code. This will be used when no NC is found in WATERS Natural Community tables for the station.

7) Much of the logic is incorporated into the view w07510.wt_swims_fibi_result_v view. This view:
   a. Determines the natural community (natural_community_code), using the value from w23321.wt_waters_natural_community if there is one, otherwise using the value from the survey itself, w07510.wt_swims_fibi_result.survey_natural_community_code.
   b. Pulls in the Warm IBI region (warm_ibi_region) and distance to lake (near_far_lake)*
   c. Determines which IBI is used (selected_ibi). This is based on the table from the specifications document:

NC, Region, Distance	Matching IBI Condition (text)	Matching IBI Score (numeric)
COLDWATER	COLDWATERIBIINTEGRITY	COLDWATERIBISCORE
COOL-WARM MAINSTEM	COOL_WARM_IBI	COOL_WARM_IBI_SCORE
COOL-COLD MAINSTEM	COOL_COLD_IBI	COOL_COLD_IBI_SCORE
COOL-WARM HEADWATER		INTERMITTENT_IBI_SCORE
COOL-COLD HEADWATER		INTERMITTENT_IBI_SCORE
WARM HEADWATER		INTERMITTENT_IBI_SCORE
MACROINVERTEBRATE		INTERMITTENT_IBI_SCORE
WARM MAINSTEM, LS	WARMWATER_IBI_INTEGRITY_LS	WARMWATER_IBI_SCORE_LS_CRRCTD
WARM MAINSTEM, NO	WARMWATER_IBI_INTEGRITY_NO	WARMWATER_IBI_SCORE_NO_CRRCTD
WARM MAINSTEM, CS, NEAR	WARMWATER_IBI_INTEGRITY_CS_NR	WARMWATER_IBI_SCRE_CS_NR_CRCTD
WARM MAINSTEM, CS, FAR	WARMWATER_IBI_INTEGRITY_CS_FAR	WARMWATER_IBI_SCRE_CS_FR_CRCTD

Please note that not all natural communities are accounted for in the above table, which means there is no selected IBI for a number of records. These natural communities are found in the data, but don't have a selected IBI. For example, the large river IBI is calculated outside of the oracle database environment (see non-wadeable fish IBI description).

NATURAL_COMMUNITY_CODE	COUNT(*)
LARGE RIVER	71
SHALLOW LOWLAND	2
RESERVOIR	2
COOL (WARM TRANSITION) MAINSTEM	1
WARM MAINSTEM	1
TWO-STORY	1

   d. Uses the selected_ibi to populate the IBI score: selected_ibi_score.
   e. Pulls in some AU data (seq_no, WBIC, waterbody name)

*Conduct spatial analysis to identify Correct fIBI (verify that fish database does not do this)

- This process incorporates spatial analysis into WT_SWIMS_FIBI_WK Table fields (TBD) or stand alone table for package to pick up.
  - There are 4 Warmwater IBI types depending on location in the state (Lake Superior Basin, Northern Region, and Central and Southern Region) and proximity to lakes

(Central and Southern Region only). This is based on John Lyons' Technical Report NC-149.

- **A column for region is needed**; technical report has figure delineating the regions on page 4. The region IBIs are:
  - Warmwater IBI Score Ls Crrctd = Warmwater Fish - Lake Superior Region
  - Warmwater IBI Score No Crrctd = Warmwater Fish - Northern Region
  - Warmwater IBI Scre Cs Fr Crctd = Warmwater Fish - Central and Southern Region, Far from Lake
  - Warmwater IBI Scre Cs Nr Crctd = Warmwater Fish - Central and Southern Region, Near to Lake

- The Warm Water Natural Community Sites in the **Central and Southern Region** have different IBIs based on whether the site was near or far from a lake. A copy of Mark Binder's original cross-reference procedure is located on the common drive.

- **A column for distance to lake (NEAR or FAR) is needed**. Definition of NEAR is a river or stream site that is less than 8 km from a lake via a stream channel.

Table/User Interface recommendations for future discussion:

- Add in columns for "NC Verified?" (Y/N field that needs to be editable) and "Updated NC" (also needs to be editable). It would be helpful to have edited content be highlighted somehow.
- For "Updated NCs" column, this will either be empty or have a recommended change based on the NC verification tool.
- Any surveys with a 9/9 for NC verification should have the "Updated NC" field filled in with NC in "Best Alternative NC". This column needs to be editable so biologists can change the NC. It would be best as a drop-down with all NCs as options.
  - This is stored in WATERS – and will be updated after preliminary run

- For each survey match the NC (Modeled or Best Alternative) to the correct IBI and Score from the original download.

WATERS Natural Community Table reflects Fish DB decision rules. Placed into five categories:

Modeled NC Correct	Modeled natural community seems to be correct. Many biologists will review these anyway.
Modeled NC Not Verified (Alt 9 of 9)	These situations are where the modeled natural community may not be the perfect fit and the best alternative is indicated. These should be manually checked.
Modeled NC Not Verified (Alt < 9)	At these sites, the modeled natural community was not verified and the best alternative does not meet all the 'thresholds' for confirmation. These should be manually checked.
Modeled NC Not Verified (No Alt)	At these sites, the modeled natural community was not verified and no best alternative is suggested. These should be manually checked. These sites may need an additional survey.
Modeled NC Valid (Tolerance)	The modeled natural community is supported but the fish assemblage indicates that that there may be an abundant of tolerant species for the selected natural community. These sites should be manually reviewed and may need additional

	monitoring.
NC Change (Manual)	These decisions are based on collective survey data and will be used primarily for stream trace features based on multiple surveys.

- Sets NC **not validated** for surveys that have a "Calculation Status" of
  - "did not target all species" [NOT INCLUDED]
  - "is too few individuals; at least 25 are required" [NOT INCLUDED]
  - "Temp Result" or "is too few individuals; at least 25 are required"

This process requires Biologist to make a NC change decision and document reasoning in WATERS database, which will be reflected in the package output.

8) The summary views are found under W23321. The first is the station summary: w23321.wt_waters_fibi_station_summ_v. This view calculates the earliest and latest survey dates, the number of surveys, the mean IBI score, and the "stand alone" flag
   a. For cases where the natural community from w23321.wt_waters_natural_community "Needs Review", the column NC_NEEDS_REVIEW_FLAG has been set to "Y"
   b. For cases where no natural community was found for the station in w23321.wt_waters_natural_community, **the column SURVEY_NC_USED_FLAG is set to "Y".**
   c. AU is associated with the station in SWIMS. In cases where the fIBI output is not limited to one assessment unit (sometimes the station will flag and upstream and downstream waters**.** The assessment team is reviewing protocols for systematically applying a singular action for this situation. However, until this protocol is detailed, the assessment coordinator will review these sites with the biologist t determine which assessment units are appropriate for the results.
   d. "Count IBIs" is the number of IBIs in a station average.
   e. "Stand Alone?" is a Y/N entry; if there are two or more IBIs in the average that are over at least two years then it is considered a Stand-Alone assessment.
   f. There may be multiple Natural Communities per station. They should be separated by " ; " and corresponding verification Y/N should be in the same order as its NC.

9) The second summary view is the AU summary: w23321.wt_waters_fibi_au_summ_v. Using the station summary view, for an AU the station with the lowest IBI score is used, looking at stations where stand_alone_flag is "Y" first
   a. The view assigns a condition category based on the NC and IBI score. A new table was created to hold the assignment of condition descriptions to NCs and score ranges: wt_waters_nc_fibi_cond_ref.
      i. The NC_NEEDS_REVIEW_FLAG and SURVEY_NC_USED_FLAG columns are also carried forward to this view.
   b. For each AU the lowest Stand-Alone Score should be used as the assessment. If there is no stand-alone score then the lowest score should be used.

Condition is determined by the average score of the selected fIBI "Excellent", "Good", "Fair", or "Poor".

Natural Community	Fish IBI Type	Fish IBI	Condition Category
Coldwater	Coldwater Fish	81-100	Excellent
		51-80	Good

		21-50	Fair
		0-20	Poor
Cool-Cold or Cool-Warm Headwater	Small-Stream (Intermittent) Fish	91-100	Excellent
		61-90	Good
		31-60	Fair
		0-30	Poor
Cool-Cold Mainstem	Cool-Cold Transition Fish	61-100	Excellent
		41-60	Good
		21-40	Fair
		0-20	Poor
Cool-Warm Mainstem	Cool-Warm Transition Fish	61-100	Excellent
		41-60	Good
		21-40	Fair
		0-20	Poor
Warm Headwater	Small-Stream (Intermittent) Fish	91-100	Excellent
		61-90	Good
		31-60	Fair
		0-30	Poor
Warm Mainstem	Warmwater Fish	66-100	Excellent
		51-65	Good
		31-50	Fair
		0-30	Poor
Large River	River Fish	81-100	Excellent
		61-80	Good
		41-60	Fair
		0-40	Poor

Assessment Package Code

This package checks the natural community code of records in the WT_SWIMS_FIBI_WK table to determine which IBI to apply. The package checks the waters natural community module for an update, and various tables including a table identifying which surveys to exclude. The tool only uses growing season survey dates (May through September) for the previous 10 years. The survey status must be DATA ENTRY COMPLETE AND PROOFED and the survey must NOT be located in a table that is designed to exclude inappropriate datasets (wt_swims_fibi_exclude_wk) where the survey type was targeted and / or where “too few fish” were found. If no data is located I the WATERS Natural Community module,

```
package body W07510.pk_swims_fibi is
  procedure p_refresh_all(i_end_year in number, i_commit in varchar2 := 'Y') is
    v_start_date date := to_date('0101' || (i_end_year - 9), 'mmddyyyy');
    v_end_date   date := to_date('1231' || (i_end_year), 'mmddyyyy');
  begin
    delete from wt_swims_fibi_result;
    insert into wt_swims_fibi_result(monit_station_seq_no, srvy_seq_no,
survey_natural_community_code,
```

```
            survey_begin_date, survey_end_date, coldwater_ibi_integrity, coldwater_ibi_score,
cool_cold_ibi,
            cool_cold_ibi_score, cool_warm_ibi, cool_warm_ibi_score, warmwater_ibi_integrity_cs_far,
            warmwater_ibi_integrity_cs_nr, warmwater_ibi_integrity_ls, warmwater_ibi_integrity_no,
            warmwater_ibi_score_ls_crrctd, warmwater_ibi_score_no_crrctd,
warmwater_ibi_scre_cs_fr_crctd,
            warmwater_ibi_scre_cs_nr_crctd, intermittent_ibi_score_sum, assessment_unit_seq_no,
            natural_community_seq_no, create_user_id, last_update_user_id)
    select ms.monit_station_seq_no, srvy_seq_no,
        upper(natural_community),
        to_date(survey_begin_date, 'dd-mon-rr'), to_date(survey_end_date, 'dd-mon-rr'),
coldwater_ibi_integrity,
        coldwater_ibi_score, cool_cold_ibi, cool_cold_ibi_score, cool_warm_ibi,
        replace(cool_warm_ibi_score, '-', ''), warmwater_ibi_integrity_cs_far,
warmwater_ibi_integrity_cs_nr,
        replace(warmwater_ibi_integrity_ls, '-', ''), warmwater_ibi_integrity_no,
        replace(warmwater_ibi_score_ls_crrctd, '-', ''), warmwater_ibi_score_no_crrctd,
        warmwater_ibi_scre_cs_fr_crctd, warmwater_ibi_scre_cs_nr_crctd, intermittent_ibi_score_sum,
        /*(select min(to_number(intersection_key))
          from wt_swims_monit_sta_isect_gv
         where monit_station_seq_no = ms.monit_station_seq_no and intersection_code = 'AU'),*/
        to_number(i.intersection_key),
        (select max(natural_community_seq_no) keep (dense_rank last order by request_date)
          from w23321.wt_waters_natural_community
         where monit_station_seq_no = ms.monit_station_seq_no),
        'FIBI_LOAD', 'FIBI_LOAD'
      from wt_swims_fibi_wk fw
      join wt_swims_monit_station ms on fw.swims_station_id = ms.station_id
      left outer join wt_swims_monit_sta_isect_gv i on i.monit_station_seq_no =
ms.monit_station_seq_no and i.intersection_code = 'AU'
     where to_number(to_char(to_date(survey_begin_date, 'dd-mon-rr'), 'MM')) between 5 and 9 /* May -
Sep surveys only */ and
        to_date(survey_begin_date) between v_start_date and v_end_date and
        survey_status = 'DATA ENTRY COMPLETE AND PROOFED' and
        not exists (select 1
                     from wt_swims_fibi_exclude_wk
                    where srvy_seq_no = fw.srvy_seq_no and
                        (calculation_status <> 'OK' or cold_temp_result = 'Too few fish'));
  update wt_swims_fibi_result
     set survey_natural_community_code = null
   where survey_natural_community_code = '-';
  update wt_swims_fibi_result
     set survey_natural_community_code = replace(survey_natural_community_code, 'COOLCOLD',
'COOL-COLD');
  update wt_swims_fibi_result
     set survey_natural_community_code = replace(survey_natural_community_code, 'COOLWARM',
'COOL-WARM');
  if i_commit = 'Y' then
    commit;
  end if;
```

```
  end;
end;
/
```

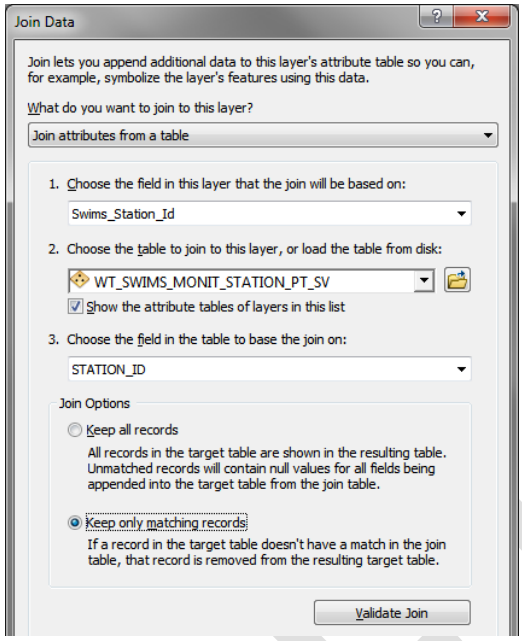
Spatial Analysis of Fisheries IBI Station

Getting the data:

- Create a geodatabase in a local folder
- Download IBI spreadsheet from Fisheries Database
  http://infotrek.er.usgs.gov/wdnr_bio
  user: wdnr password: biology4u
  click "IBI reports"
  click "All_IBIs
  click "actions buton, then download from the CSV format. click "to view or save" and save to local drive
  import the excel file to the geodatabase
- Copy SWIMS_MONIT_STATION_PT_SV from SDE to geodatabase
- Copy WD_HYDRO_WATERBODY_AR_24K from SDE to geodatabase
- Copy the IBI Regions layer to geodatabase

Preparing the data

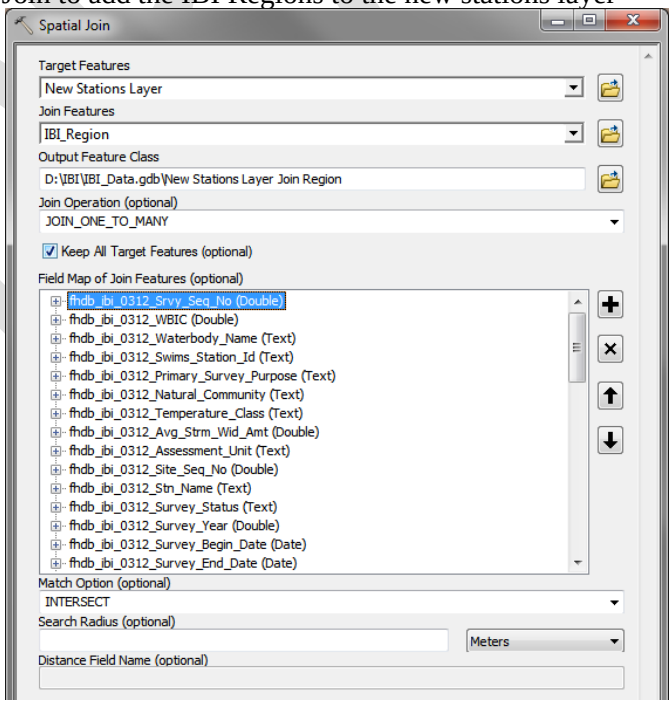
- Calculate the WTM X and Y location values for SWIMS_MONIT_STATION_PT_SV
- Calculate the polygon areas in hectares for WD_HYDRO_WATERBODY_AR_24K
- Create a new mxd in ArcMap
- Add IBI spreadsheet, SWIMS_MONIT_STATION_PT_SV, and WD_HYDRO_WATERBODY_AR_24K to mxd.
- Define the IBI spreadsheet for the target years (2003-2012) using the "Survey_Year" field
- Create a new IBI spreadsheet with only the target years data
- Right click on the new IBI spreadsheet and create a join using attributes from a table with the SWIMS_MONIT_STATION_PT_SV layer



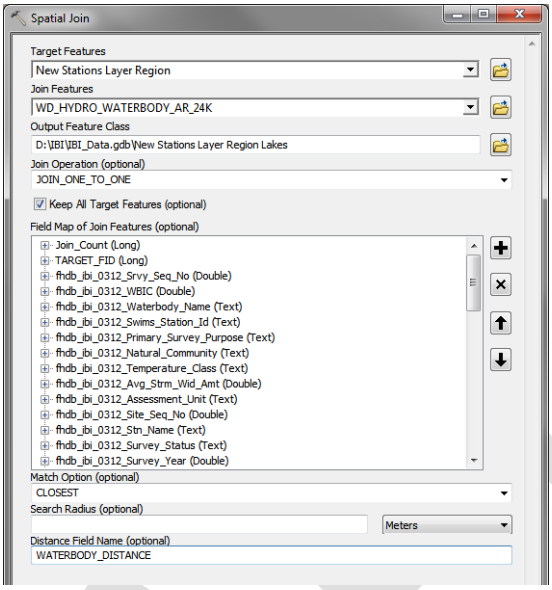
- Right click on the new IBI spreadsheet and "Display XY Data…" using the values calculated earlier.
- Right click on the displayed spatial data and click "Data/Export Data…" to create a new stations layer in the geodatabase. This creates a new layer that contains all of the IBI spreadsheet data and SWIMS stations data.
- Define the WD_HYDRO_WATERBODY_AR_24K layer so the area in hectares is greater than 4.

Joining the Data Layers

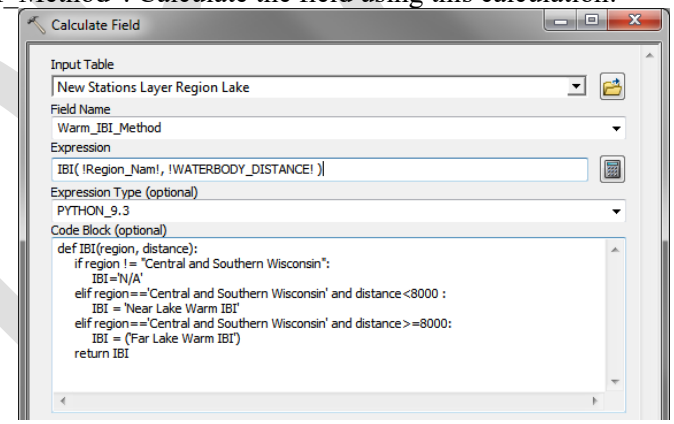
- Create a Spatial Join to add the IBI Regions to the new stations layer



- Keep all of the new stations layer attributes but you only need the “Region_Nam” from the IBI Regions layer and run the join.
- Create a Spatial Join to add the waterbodies and distance to the new stations with regions layer



  - Note that the Match Option (optional) is set to CLOSEST, Search Radius (optional) is blank but set at Meters and Distance Field Name (optional) is WATERBODY_DISTANCE
  - You only need the WATERBODY_ROW_NAME and WATERBODY_WBIC attributes from the WD_HYDRO_WATERBODY_AR_24K layer. Run the join.
  - You should now have a stations layer that includes the IBI regions, closest waterbody that is greater than 4 hectares, and distance to the closest waterbody that is greater than 4 hectares.
  - Open the attribute table for this new stations layer and add a text field called “Warm_IBI_Method”. Calculate the field using this calculation:



- You now have a points layer with all of the IBI surveys and associated SWIMS stations, IBI Region, closest waterbody >4 ha name, WBIC, and area, and Warm IBI Method for stations in Central and Southern Wisconsin.