

# **Evaluation of Accuracy and Operation of the Water Withdrawal Assessment Screening Tool**

**Submitted by the Michigan Water Resources Conservation Advisory Council  
to the Michigan Legislature**

**April 9, 2009**

As a component of the new state Water Withdrawal Assessment Process (WWAP), the internet-based Water Withdrawal Assessment Tool (WWAT or Screening Tool) was put online October 1, 2008, with the intent of operating it in a testing mode for several months. We were asked to “conduct testing and evaluate the operation and the accuracy of the assessment tool, including implications of section 32706e” (phase-in provision), and to submit a report “that contains the results of its testing and evaluation and any recommendations that the council has to improve the operation of the assessment tool.” This report summarizes the results from this testing period.

## **Executive Summary**

The WRCAC concludes that the Screening Tool currently provides an effective statewide program tool and carries out the appropriate screening function. The Screening Tool is ready for full implementation on July 9, 2009. But as we endorse this launching of the Screening Tool, we also emphasize that continued refinements must be expected in response to needs identified by user publics and state agency developers.

We found the Screening Tool’s determinations to accurately reflect the distribution of water availability across Michigan. The Screening Tool currently returns an automatic authorization in about 80% of typical cases statewide. Further detailed inspection of these locations substantiated an abundant water supply. And the Screening Tool appropriately flags a small set of cases either where the proposed withdrawals are large enough to warrant attention by DEQ staff or where the local aquatic ecosystems are especially sensitive to the water withdrawal volume proposed. Staff at DEQ compared results from the Screening Tool with detailed site-specific reviews for several example sites and, in every case, the Screening Tool results were logical and appropriate. We are also satisfied that the river type classification maps accurately reflect the current state of scientific knowledge about the ecological character of Michigan’s river systems.

Education regarding water resources and the new assessment process has been facilitated through the Screening Tool internet site, in a series of hands-on workshops facilitated through Michigan State University, and through other presentations. Structured user feedback was obtained through the internet site and from a workshop survey form. Overall the feedback we received confirmed the logic and effectiveness of the assessment process, and especially the effectiveness and value of the Screening Tool. This feedback also provided valuable suggestions that incorporated into the tool improving its effectiveness. With these improvements, the WRCAC finds the Screening Tool is operating well and ready for full implementation in July.

## **Evaluation of Accuracy**

We addressed three aspects of accuracy of the Screening Tool. First we examined whether the tool and its component models provided an accurate representation of accepted scientific concepts and relationships. Second we examined whether error rates of the component models were minimal or reasonable. Third we examined whether the tool works appropriately as a “screen” in determining the expected proportion of proposals that is easily approved versus the proportion that is flagged for subsequent site-specific review,

due to some combination of larger proposed withdrawal and more limited water availability. A performance expectation was clearly set by the Groundwater Conservation Advisory Council's in their list of guiding principles, including: "1. Michigan has an abundance of water resources, both groundwater and surface water. Certain groundwater sources can support a large amount of withdrawal without harm to other users or to the ecosystem. Other groundwater sources are more vulnerable to large withdrawals."; and "8. Some areas of the state have been identified as sensitive to groundwater withdrawal. Current and future withdrawals in these areas require a higher degree of monitoring, scientific research, and understanding." (GWCAC 2006).

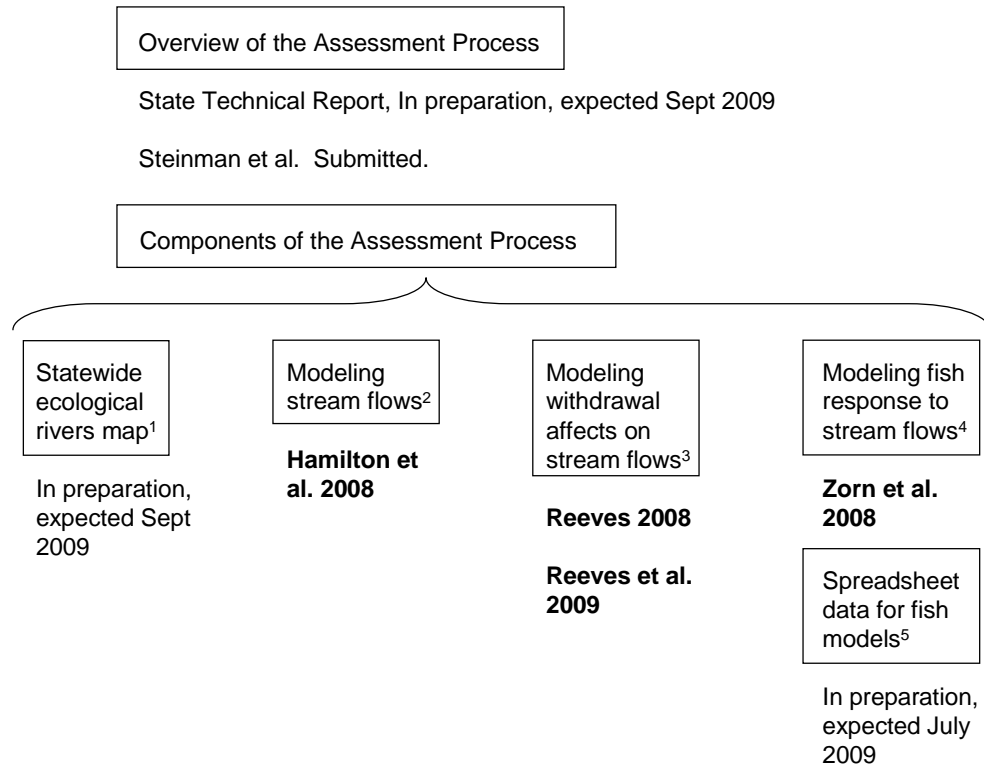
#### *Accepted scientific concepts and relationships*

Publication of concepts, methods, and analyses in either peer-reviewed governmental technical series or peer-reviewed scientific journals provides the most accepted test of scientific merit. Four peer-reviewed government technical reports describing component models were published in 2008 and several more are in preparation (Figure 1; see also References section). These reports document the methods used in building the models, and evaluate model assumptions and predictive accuracy where possible. A report providing an overview of the entire assessment process, one detailing the ecological rivers map, and another providing the data spreadsheets behind the fish response models are all in preparation, with expected publication during 2009 (Figure 1). Many requests for these documents have come from Michigan, regional, and national levels. In addition, the Michigan Water Withdrawal Assessment Process and Screening Tool has been well received by the broader "environmental flows" science community, evidenced by its prominent use as a leading example in regional and national discussions of science-based management of river flows (e.g., <http://conserveonline.org/workspaces/eloha>).

#### *Error rates of the component models*

The overall technical accuracy of the Screening Tool is unknown at this time. This can only be determined through long-term, field level studies. Each of the component models contain assumptions and prediction error rates that are covered in the respective technical reports. In overview, the predicted index flow by the stream flow models (Hamilton et al. 2008) explains about 94% of the variability in index flows as calculated from streamflow gaging station records. To account for possible under predictions of index flow, a "safety factor" of 0.50 was built into the Screening Tool (GWCAC 2007). Using this safety factor, the flow used in the model will be more than the actual flow in the stream only 10% of the time. This provides a level of reasonable conservatism to assure policy makers that the Screening Tool will not frequently authorize withdrawals for more water than can be safely withdrawn without causing an Adverse Resource Impact (ARI). The groundwater withdrawal model (Reeves et al. 2009) accurately reproduces the selected analytical solution and provides reasonable results when compared with a numerical groundwater model of Kalamazoo County. The fish response models (Zorn et al. 2008) are summaries of empirical relationships observed in Michigan; variation in these relationships is discussed and illustrated in the report but not quantified.

Figure 1.—Planned technical documentation for the Water Withdrawal Assessment Process and Screening Tool, with publication status indicated. Published documents are also in bold font.



<sup>1</sup> Report describes delineation of Michigan’s river systems into ecological river segments, as well as assignment of habitat and fish assemblage attributes to each segment and subsequent classification of segments into 11 river types.

<sup>2</sup> Report describes development of a statistical model of the relationship between climate and landscape attributes of the drainage catchment, and index (summer low) stream flow data from Michigan river segments with flow gaging stations. This model was used to estimate index flow at all ungaged river segments.

<sup>3</sup> Report describes development of a mathematical model of the generalized relationship between a well withdrawal, depletion patterns in the surrounding aquifer, and reductions to the index flows of nearby streams and rivers. This model is used in the Screening Tool to dynamically estimate river flow reductions from any proposed well withdrawal.

<sup>4</sup> Report describes development of graphs showing the declining response in fish population metrics to sequential reductions in river Index Flow and related increases in river summer temperature. Relationships were developed for each of the 11 river types using extensive survey data from Michigan rivers. These relationships were the basis for setting policy zone criteria within the WWAP.

<sup>5</sup> Report publishes the fish assemblage and temperature spreadsheets used to create the graphs in Zorn et al. (2008).

We find that the river type classification maps accurately reflect what is currently known about the ecological character of Michigan's river systems. The maps represent the joining of extensive survey data, numerous statistical analysis and modeling efforts, and local field expert review. Actual classification error rate is unknown but one can get a sense from studies of some of the precursor or component models: Lyons et al. (in press; the source of the thermal classification) reported that temperature data explained 65% of variation in fish assemblage response; and DNR thermal classifications (unpublished) were found to be 60-70% accurate. Assuming that the quantitative classification models got us to this 60-70% accuracy range, in 2008 the Michigan Department of Natural Resources, Fisheries Division staff provided a very extensive and intensive river map review that corrected remaining modeling errors to the extent possible. Finally, our review found that the maps accurately reflect the specific criteria for minimum drainage areas established in the 2008 law (MCL 324.32706A).

The map river linework is at a scale of 1:100,000. This is a widely accepted national standard database (USGS NHD plus) and a reasonable starting point for the 2008 Screening Tool but there is agreement among Michigan experts that the mapping framework should move to the more accurate 1:24,000 scale as soon as possible. This does not currently exist as an USGS NHD plus product but could be rapidly developed. The tool makes decisions at these more accurate scales, and some of the component datasets are actually at 1:24,000, but the base river linework is constrained to the coarser 1:100,000 scaling. Other elements of Michigan's digital water management framework exist at 1:24,000 and it is clearly desirable to align related water resources datasets. We recommend that the WWAP be moved to the 1:24,000 scale when possible.

#### *Whether the tool works appropriately as a "screen" - testing existing wells*

The Screening Tool is designed to provide users with results that will both protect the state's water resources and efficiently authorize water withdrawals, where appropriate. To assure efficiency, the Screening Tool should authorize withdrawals that are small relative to the available water resources. And to protect the aquatic environment, it should flag for site specific review any proposed withdrawal that is so large relative to the available water that it has the potential to cause an Adverse Resource Impact. Two performance tests were conducted by applying the Screening Tool to actual wells. Again, the expectation was that water resources are abundant across most of the state but limited in specific areas, thus Screening Tool determinations should reflect this pattern.

In the first test, fifteen random large capacity wells were selected from each Michigan county using the entire Wellogic database. If fifteen large capacity wells were not recorded in a county, the number available, if any, was used. This provided a geographically distributed test. A total of 800 wells were used in this first test. The second test included all large capacity wells recorded in Wellogic since the water withdrawal legislation went into effect February 6, 2006. There were 545 wells used in the second test.

The results were very similar from the two tests (Table 1). The numerous cases where a proposed withdrawal will obviously not cause an ARI were identified and automatically authorized. Based on this analysis, users would have received an "A zone" approval approximately 80% of the time. Site specific reviews would have occurred because of a possible ARI about 10% of the time, and reviews because of Zone C or cold-transitional watersheds about 7% of the time. The actual percentage of required site specific reviews will likely be less because many users will be able to modify their proposal, based on information from the tool, so that they subsequently obtain approval through the tool. Future results may change based on changes to the tool and cumulative water withdrawals through time.

Table 1.–Results from processing two sets of actual well data through the Screening Tool. Percentage results that highlight both ends of the assessment spectrum (zones A and D) are highlighted in bold font. Note the consistency in the percentages from the two independent evaluations.

	From a set of stratified (by County) random set of 800 wells across the state.		Using actual constructed wells since February 2006, from the well registration data.	
	Number	Percent	Number	Percent
<b>Total Number of Wells Used in the Evaluation</b>	800		545	
Over the ARI in source watershed (Zone D)	59	7%	38	7%
Over the ARI in neighboring watershed (Zone D)*	17	2%	16	3%
<b>Total number flagged as over the ARI</b>	<b>76</b>	<b>10%</b>	<b>54</b>	<b>10%</b>
Zone C in source watershed	18	2%	10	2%
Zone B in source watershed(for cold, cool, or warm)	34	4%	40	7%
Zone B in source watershed (for cold transitional)	40	5%	26	5%
Zone A in source watershed	649	<b>81%</b>	431	<b>79%</b>
without neighboring ARI*	637	<b>80%</b>	417	<b>77%</b>

\* The count in each zone was revised to subtract wells that cause an ARI in a neighboring watershed. 17 wells over the ARI were in neighboring watersheds while 59 were in the source watershed for a total of 76 watersheds flagged or approximately 10%.

Further review of the 545 most recent large capacity wells confirmed that these results are reasonable. Approximately 10% of the wells are located in bedrock that is isolated from streams or are in small watersheds immediately adjacent to the Great Lakes (flow directly into the Great Lakes); withdrawals from groundwater in both of these cases receive an automatic pass from the Screening Tool as not likely to cause an ARI. Roughly 68% of the wells are located in watersheds where the available water, before possibly causing an ARI (based on the hydrology model used in the tool), is at least eight times more than the projected streamflow depletion. Most of the remaining 22% of wells will either require a site specific review, or fall within the B Zone where notification of watershed interests is required prior to developing the proposed well. When the tool becomes fully operational, it will also keep track of cumulative withdrawals, and identify those watersheds where the combined effect of all of the new or increased withdrawals may cause Adverse Resource Impacts.

This review determined that Screening Tool determinations accurately reflect the distribution of water availability across Michigan. It gives an automatic authorization in about 80% of typical cases statewide and further detailed inspection of these substantiated an abundant water supply. And the Screening Tool flags a smaller set of cases either where proposed withdrawals are large enough to warrant further attention by DEQ staff or where aquatic ecosystems are especially sensitive; these cases receive focused attention by DEQ staff when requested. Thus the Screening Tool does: 1) provide an efficient statewide program tool; and 2) carries out the appropriate screening function.

#### *Comparing Screening Tool response with DEQ site level review*

The Screening Tool is based on statewide information that involves many generalizations. The tool gives an accurate representation of general hydrologic conditions in various regions across the state. However, it is recognized that the Screening Tool cannot possibly reflect the specific conditions at every site in the state. Site-specific reviews are appropriate and necessary to resolve questions of potential environmental

impact when the tool does not provide an authorization (i.e., it flags a concern regarding possible ARI). Site-specific review means using additional hydrologic and other information that is available for a particular site to most accurately determine the likely impact of a water withdrawal on the neighboring water resources. As part of our evaluation, site specific reviews from nine sites were compared with the results from the Screening Tool, as examples of how the Screening Tool works within the larger assessment process.

In every case, the Screening Tool results were logical and appropriate (Table 2). This can be effectively illustrated by describing two situations where the tool determined that an Adverse Resource Impact was likely. The first example was a proposed surface water withdrawal from a relatively small stream. The tool appropriately determined there was not enough water in that stream to support the withdrawal. However the site specific review, confirmed by a site inspection, found the location was in backwater from a dam located on a much larger river. Therefore, since the water would actually be from the large river, the impact would be in Zone A and the withdrawal could be approved. The second example was a proposed well located in the watershed of a large river but near a small cold stream. The Screening Tool indicated an Adverse Resource Impact was likely to the cold stream. The site specific review determined that the proposed well would be in a deep aquifer that is not connected to the shallow aquifer that sustains the cold stream. Therefore, the proposed well would not adversely impact the stream and it could be approved. This determination could not have been reached without the site specific review. Both of these cases reflect the additional flexibility offered to water uses through the site specific review process as envisioned by the Council and the legislation .

Table 2.–Comparison of selected Screening Tool results with site specific evaluation results

<b>Number of Sites</b>	<b>Screening Result</b>	<b>Site-specific Result</b>
2	A Zone; withdrawal authorized	Confirmed A Zone
3	ARI; site-specific review needed	Confirmed likely ARI
2	C Zone; site-specific review needed	Tool appropriately determined need for site-specific review
2	ARI; site-specific review needed	Withdrawal allowed as a result of site-specific review

### *Potential Downstream Impacts*

During our reviews we identified a significant technical problem that is not currently addressed by the Screening Tool. It relates to the upriver - downriver relationship of certain river segments. Downriver segments have larger index flows than upriver segments, thus cumulative withdrawals from upriver segments would not generally violate the ARI criteria of a downriver segment. However, when a downriver segment is assigned a much lower ARI criteria, as in the case of Cold-Transitional river types (3-5% compared with 20-25% allowed withdrawals in the other river types), a downriver ARI violation could happen due to cumulative upriver withdrawals that are each not in violation within their own source watershed. In such cases the Screening Tool does not make an accurate determination and could allow an ARI to occur in a downriver segment. Thus, the actual limiting factor in the upriver segments in these cases would be the pinch point of the most restrictive river segment (either the source segment or a downriver segment; such restriction typically associated with a cold-transitional river segment).

This downriver accounting problem is most acute for certain Cold-Transitional Stream and River segments that are downriver from Cold Stream and Cold Small River segment types. In such cases cold water from upriver likely helps to maintain the colder temperatures of the downriver segment of concern; cumulative withdrawals of sufficient volume upriver could cause an ARI downriver in these highly restricted segments. The initial version of the Screening Tool was designed to screen for potential ARIs in neighboring segments (beyond the withdrawal's home segment). To protect against upstream withdrawals

causing downstream ARIs, we recommend that the screening function be extended to account for Cold-Transitional segments downriver of Cold segments, which is consistent with the terms of Part 327. We have identified about 90 Cold-Transitional Stream and River segments that could have ARIs violated through cumulative upriver withdrawals in Cold tributaries, and calculations show that the ARI violation can easily be >500% (Table 3). Many of the small and large river segments of concern support Michigan’s prized trout fisheries; for example portions of the Au Sable, Manistee, Pere Marquette, White, and Boardman rivers.

Potential adverse effects are not as clear for situations where the upriver segment types are cool or warm streams or rivers, or where dams or large lakes warm the outflow and form the boundary between Cold and Cold-Transitional river systems. Such complex situations merit further review before final decisions are made on how to address each circumstance. We will thoroughly examine these situations and provide recommendations in our August report to the state legislature.

Table 3.–Cold transitional rivers compared with ARIs for tributaries.

Downriver Cold-Transitional rivers				Upriver Cold streams and rivers		
Segment #	Name	Drainage area (mi <sup>2</sup> )	ARI (gpm)	Tributary name	Drainage area (mi <sup>2</sup> )	ARI (gpm)
12643	Au Gres River, E Br	94	144	Guiley Creek	31	800
				Smith Creek	23	251
				Hale Creek	24	193
10125	Au Sable River	1533	8346	Au Sable River	302	13058
11580	Bear Creek	204	489	Cedar River	24	584
10905	Big Creek	192	649	Big Creek, M Br	27	837
11385	Big Creek, E Br	195	776	Big Creek, E Br	110	4581
				Big Creek, W Br	78	3191
14452	Boardman River	271	867	Boardman River	265	9015
12759	Brule River	294	352	Iron River	97	1849
21105	Cedar River	106	281	Cedar River	33	1107
16362	Coldwater River	189	154	Bear Creek	48	263
				Duck Creek	28	173
21219	Dowagiac River	283	709	Pokagon Creek	36	840
				McKinzie Creek	18	557
				Peavine Creek	11	283
14710	Fence River	88	200	Fence River, E Br	42	1001
11156	Hersey River	116	249	Hersey River	88	2050
10138	Little Muskegon River	153	414	Shinglebolt Creek	14	403
11298	Manistee River	488	3091	Manistee River	238	11219
4691	Manistee River	1392	7266	Pine River	269	8289
13430	Maple River	158	384	Maple River, W Br	93	2873
9993	Ocqueoc River	127	325	Little Ocqueoc River	21	708
10472	Ontonagon River, E Br	259	579	Ontonagon River, E Br	71	1658
				Jumbo Creek	42	872
5153	Paint River	210	513			
10337	Paint River, N Br	117	268	Golden Creek	12	277
11713	Paint River, S Br	92	246	Paint River, S Br	82	2291
11676	Pere Marquette River	409	2739	Pere Marquette River	328	13519
12259	Pine River	99	195	Pine River	34	1074
1716	Shelldrake River	93	192	Shelldrake River, S Br	18	346
13032	Sturgeon River	225	825	Sturgeon River, W Br	76	3630
9953	White River	500	2447	White River, N Br	109	3472
13494	White River, S Br	217	712	White River, S Br	75	3152

## Evaluation of Operation

In evaluating whether the Screening Tool is operating well, we considered aspects such as: ease of use; provision of rich information on water management, science, and policy; provision of a confidential and comfortable environment for exploring alternative withdrawal proposals (thinking about wise withdrawals); clear communication of complex information from integrated disciplines, and clean function of technologies. Educational efforts were made through the Screening Tool internet site, focused hands-on workshops, and other presentations; while structured user feedback was obtained through the internet site and a workshop survey form.

### *Initial internet use of Screening Tool and feedback from online users*

The law creating the Water Withdrawal Assessment Screening Tool took effect on July 9, 2008, with a requirement to make it available for testing and evaluation on October 1, 2008. This short time frame meant that the initial on-line version was still a “draft”, with the developers continuing work to finalize it. How are inexperienced users receiving and experiencing the new online Screening Tool? What are we doing with their feedback?

There has been strong public interest in the Screening Tool. Interested parties immediately began testing it on-line for many conditions, in every part of the state. From October 1, 2008 until March 19, 2009, about 3,270 unique visits were made to the Water Withdrawal Assessment Screening Tool internet site. This is about 545 per month. About 34% of these were return visits. Current tracking indicates that over 20% of the users spend over an hour using the WWAT.

The website includes a “feedback button” to provide comments. The Department of Environmental Quality, Water Bureau (DEQ WB) received 39 comments from the “feedback button” between October 1, 2008 and January 31, 2009. The DEQ WB provides individual responses to each comment. These are updated monthly and posted on the website. They can be viewed using the “FAQ” button in the Information Window at: <http://www.miwwat.org>. We summarized user comments under four categories: 1) *Improving Functionality*, 2) *Screening Tool Operation*, 3) *Questioning Site-Specific Application*, and 4) *Questioning the New Legislation*. Each category is described below, with some brief examples illustrating how comments were addressed. A complete summary is provided as Appendix 1.

- 1) *Improving Functionality*. Comments are placed in this category if they deal with appearance of the tool, navigation of the website, or how information is displayed.

Any simple corrections were quickly implemented. For example, the “ground water withdrawal” option was changed to be the default (as recommended), since ground water withdrawals represent the clear majority of large quantity withdrawals.

Some comments reflected a lack of familiarity with Geographic Information Systems (GIS), which can be a hindrance to operating the tool. Additional instruction will be added to assist those not familiar with navigation around GIS.

- 2) *Screening Tool Operation*. Initially there were several technical problems that caused the Screening Tool to operate very poorly, or not at all.

Sometimes map navigation defaulted to an area outside of Michigan. The technical team concluded that these problems are browser-specific and work is ongoing to address browser compatibility issues.

Several users questioned why they received a negative outcome at one location, but a pass at very nearby locations. These problems were traced to the erroneous assignment of a “zero flow” to some extremely small river segment drainages. All such drainages were identified and their flow data corrected.

Some individuals found the Screening Tool to be completely non-functional. Most of these situations existed when users failed to disable pop-up blockers in their internet browsers. A warning was added

at the very start of the process, reminding users to disable their pop-up blocker. The warning includes a link to instructions on how to disable the blocker for various browsers.

- 3) *Questioning Site-Specific Application.* Less than 10% of respondents questioned the applicability of the Screening Tool at a specific location.

For example, the Screening Tool can estimate that a given stream will experience a significant withdrawal impact when the user has local information suggesting something different. This discrepancy can be explained. Some simplifying assumptions are necessary for development of a statewide Screening Tool, and the presence of a connection between aquifer and stream is one of those assumptions. Of course there are localized exceptions to this generalization and these often generate criticism. The new law is using, by definition, a “screening” tool. When a proposed withdrawal fails the screening process, the subsequent site-specific review will critically examine any locally specific information on the connection between aquifer and adjacent streams.

Some comments expressed strong concerns that the Screening Tool mischaracterized “environmentally sensitive” areas. They concluded that large withdrawals passing the screening evaluation would be disastrous. However, reexamination of underlying data sets and other relevant information allowed the technical team to conclude that the areas in question were appropriately characterized, capable of sustaining very large ground water withdrawals.

- 4) *Questioning the New Legislation.* These comments questioned the appropriateness of the water withdrawal legislation per se, rather than the accuracy or operation of the tool itself.

*Improvements made to the Screening Tool*

The feedback also provided valuable suggestions that have been incorporated into the tool and further improve its effectiveness. The major changes are listed in Table 4.

Table 4.–Major improvements made to the Screening Tool since Oct 1, 2008, in response to suggestions from users.

Improved browser compatibility	Added ability to query database
Added aerial photography	Simplified labels in database
Put feedback button on initial screen	Added answers to questions button
Added more detailed instructions	Added information to stream database
Added more background material	Added shallow pond option for withdrawal
Added pop-ups for clearer instructions	Improved format of report page
Made groundwater withdrawals default option	Improved registration page
Corrected errors in map and database	Improved visual layout

### *Conducting a series of workshops on use of the Screening Tool.*

The WRCAC sought the assistance of a team from Michigan State University's Institute of Water Research (IWR) and Extension Water Area of Expertise (WAOE) to develop a new workshop series which included a hands-on demonstration of the tool; and also provided a thorough overview of the Great Lakes Compact, the science underpinnings of the tool, and information about the groundwater and surface water resources of the region where each workshop was held. MSU WAOE, using MSU Extension funds, was able to rapidly and effectively respond to the WRCAC's request for outreach assistance. Since the Screening Tool went on-line in October 2008, the MSU team has held ten workshops aimed at reaching the full range of water use interests and also at achieving broad geographical coverage across the more populated southern portion of the state (Figure 2). Workshops were planned, promoted, and led by the MSU team, with some assistance from DEQ and DNR staff. MSUE County Offices took the lead in publicizing the event in their area and they made all of the local arrangements. At the Genesee meeting, the Center for Applied Environmental Research at UM-Flint assisted with the local arrangements. The MSU team also developed a series of handouts and a powerpoint presentation that has been added to the Screening Tool web site (see Educational Materials). About 270 people, representing a great variety of water use interests, attended these workshops; a list of all of the participants and their water use interest is available on the event web site ([www.iwr.msu.edu/events/wwat](http://www.iwr.msu.edu/events/wwat)).

Five local MSU Extension education programs were held in Kalamazoo, Coldwater, Allegan, McBride, and Centreville, reaching an additional 174 stakeholders, primarily from the agricultural irrigation sector (Figure 2).

In addition to these face-to-face workshops, the MSU team organized a webinar and this was broadcast on January 9, 2009 (Figure 2). This was designed as an in-service for MSUE staff, statewide. About 28 people attended the live webinar, but it was also recorded (as digital Flash files). Each of the major webinar sections was recorded separately and all seven parts have been posted on both the Water AOE web site ([web1.msue.msu.edu/waterqual/projects-97.html](http://web1.msue.msu.edu/waterqual/projects-97.html)) and the Water Withdrawal Assessment web site ([www.miwwat.org](http://www.miwwat.org), see Educational Materials).

For all of these sessions, including the webinar, a standard evaluation survey inquiring about perceptions of the tool and its usability was distributed. A total of 127 surveys were completed, representing a representative sample of potential users of the Screening Tool. The results of these surveys are discussed in the next section.

### *Feedback from the workshops.*

At nine of the workshops, the same survey questionnaire was distributed to the participants. In all, 112 surveys were completed. The rate of return varied from 19% to 74% among sites, but the average return rate for all nine workshops was 50.6 percent. A wide range of water use sectors were represented by workshop attendees (Table 5).

After completing the workshop, most (82%) of the participants felt they understood the water withdrawal assessment process moderately well or very well. About 85% of the participants stated that they understood the reasons for using the Screening Tool very well. The majority (72%) of users had a favorable or very favorable initial reaction to the WWAT. One stakeholder wrote, "This tool could have been a very complicated and intimidating .... However, I found the tool was easy to use. This is very impressive." Nearly three-fourths of those who used the tool during the workshops found it easy to navigate in and use. This may be because nearly the same proportion of the participants had some familiarity with GIS technology prior to attending the workshop. More than two-thirds of the users reported that they did not encounter any specific problems when using the Screening Tool.

Figure 2.—Locations and number of attendees at Screening Tool educational workshops led by a team from Michigan State University’s Institute for Water Research and Extension, WAOE; and at additional extension programs.

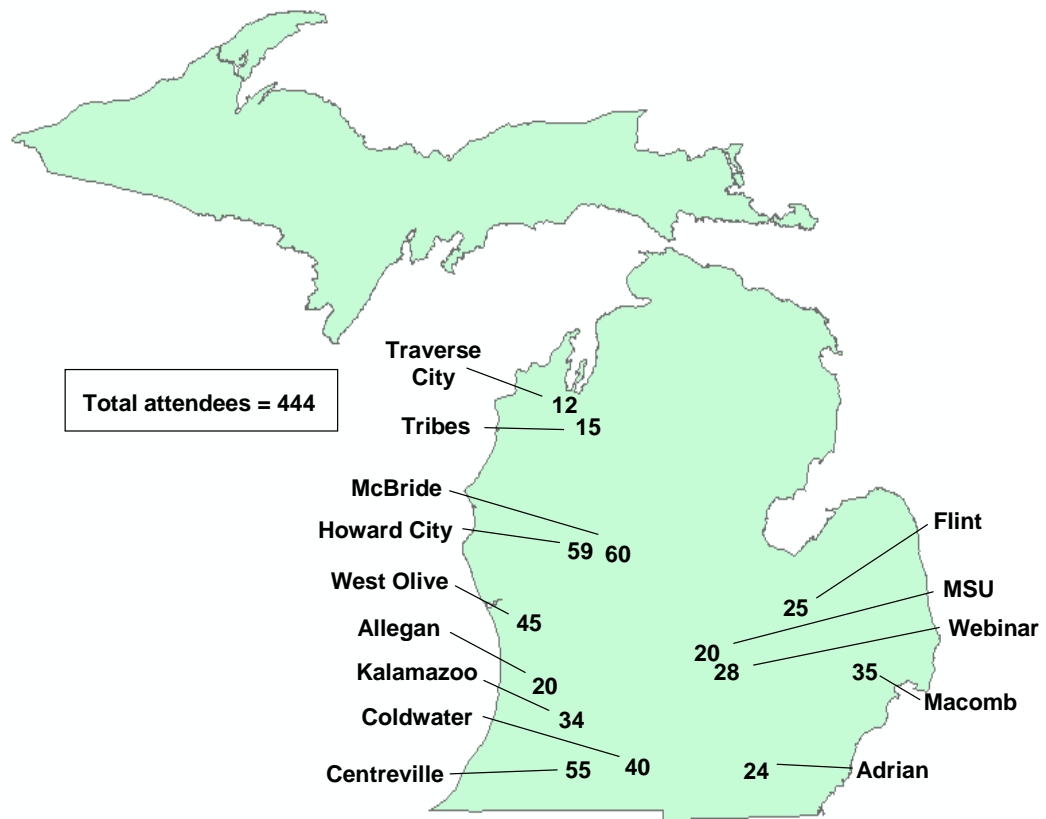


Table 5.—Water use sectors represented at the Screening Tool workshops.

<i>Water use Sector</i>	<i>% of total responding</i>
Agriculture	33
Consultants	8
County Government	7
Education	3
Fisheries/Wildlife Manager	2
Golf Course Maintenance	2
Industry	8
Local Government	9
Local Health Dept.	7
MI Groundwater Stewardship Program	2
MSU Extension staff	2
Public Water Supply	6
Tribal Natural Resource/Gov	2
Watershed/environmental groups	5
Water Well Contractor	2
Well Supply	2

Regarding the results generated by the Screening Tool, it is significant that 90% of the users were somewhat to very confident in the outcomes (*i.e.*, only 9% of the users said they lacked confidence in the results from the Screening Tool). A similar high proportion of users felt they understood their options reasonably well if their initial request to withdraw does not pass the screening process. And 81% of the participants said they were likely going to tell others about the Screening Tool.

About 25% of respondents thought that changes were necessary to the Screening Tool. Common suggestions for changes included: updating the digital well records to include all large quantity wells; further refining and ground-truthing of the river map (especially the stream flow data); and, as one participant wrote, “The model needs to be continuously updated over time to address currently identified issues or weak spots and new issues as they arise.”

Appendix 2 presents the raw data collected from the questionnaires, including all the comments that the participants wrote.

#### *Other outreach efforts.*

Staff from MSUE and MDNR collaborated to develop a fact sheet of Frequently Asked Questions concerning the Water Withdrawal Assessment Process. It has been published (electronically) as an MSU Extension Bulletin (WQ60) and is available on line at: <http://web2.msue.msu.edu/bulletins/Bulletin/PDF/WQ60.pdf>.

Members of the GWCAC, the Screening Tool technical team, and others have also given numerous presentations to various interest groups, representing Michigan and regional and national interests (Table 6). These are distinguished from the above in that they did not involve hands-on training nor feedback surveys. Pooling all outreach efforts we see that, between October 1, 2008 and March 31, 2009, we have worked directly with ~1800 Michigan citizens; and although this is a fraction of the state’s potential water users, we did achieve a very good representative coverage of the spectrum of Michigan’s water user interests.

#### *Status of DEQ water accounting database system.*

Operation of the WWAP requires an accurate database to track the location and amounts of withdrawals. Amendments to Part 327 require a location (latitude-longitude) for all wells capable of making a large quantity withdrawal (LQW). The DEQ water use database is being augmented with locations of water withdrawals as users provide them. This process is almost complete for data maintained by the DEQ, and will allow full spatial integration of the database. Until recently the agricultural sector was not required to report water use or provide locations on LQWs. We addressed this need with recommendations in our January 6, 2009 report to the state legislature.

A water availability database is also being developed with the Water Withdrawal Assessment Tool. The purpose is to maintain the accounting of water available through the tool. It will be operational when the tool is fully implemented on July 9, 2009. It will keep track of cumulative withdrawals based on registered capacity in the source and adjacent watersheds. Details of how this database of registered capacity will operationally relate to the state’s database of annual reported use are still being developed. We will continue to monitor, advise, and report as these are formalized.

Table 6.–Audiences reached with presentations on the Screening Tool by members of the GWCAC, the Screening Tool technical team, and others.

<b>Michigan Water Use Interest Group</b>	<b>Number of Attendees</b>	<b>Michigan Water Use Interest Group</b>	<b>Number of Attendees</b>
Ag's Conf on the Environment	80	Michigan Well drillers	8
American Water Works Assn., Michigan Chapter	100	Ottawa County officials	60
Burt Lake Preservation Assn.	15	Petoskey Presbyterian Men's group	11
Elk Rapids Chain of Lakes group	16	Spring Arbor Univ., Science Dept.	80
Friends of the Maple River	50	The Nature Conservancy, Michigan Chapter, Conservation Cafes (x2)	50
Gaylord University Center, Environmental Ethics class	25	The Nature Conservancy, Michigan Chapter in-service.	20
GL Fruit and Vegetable Annual	50	Tip of the Mitt Watershed Council (TOMWC), Briefings to major donors	12
Lake Charlevoix Assn.	20	TOMWC, Ice Breaker Series	11
Ludington church group	8	TOMWC, Lake Michigan Summit	38
Little Traverse Bay Bd., Odawa Tribe	5	Tri-County Regional Planning Commission (Groundwater Management and Technical Advisory boards)	20
Michigan Aggregates Association, Technical Advisory Committee	20		
MI Democratic Party event	15	<b>Michigan Total</b>	<b>1300</b>
MI DNR, Fisheries Research Section	40		
MI Farm Bureau, Berrien Co.	75		
MI Farm Bureau, Commodities	60		
MI Farm Bureau, MSU Collegiate	40	<b>Regional or National Water Use Interest Group</b>	<b>Number of Attendees</b>
MI Farm Bureau, SE counties	80		
MI Land Improvement Contractors	30	The Nature Conservancy, Wisconsin Environmental Flows Program workshop	30
MI Potato Growers	4	The Nature Conservancy, National Environmental Flows Program workshop	40
MI Sod Growers	75	U.S. EPA, Region 5, Surface Water Quality scientists	200
MSU Civil Engineering Dept.	30		
MSU Great Lakes Conference	152		

### **Implications of the phase-in provision.**

Act 185 PA2008 requires adjustments of the water withdrawal accounting of new or increased water withdrawals installed October 1, 2008 through January 31, 2009 when the new zone lines became effective on February 1, 2009. The requirement is found in the following section:

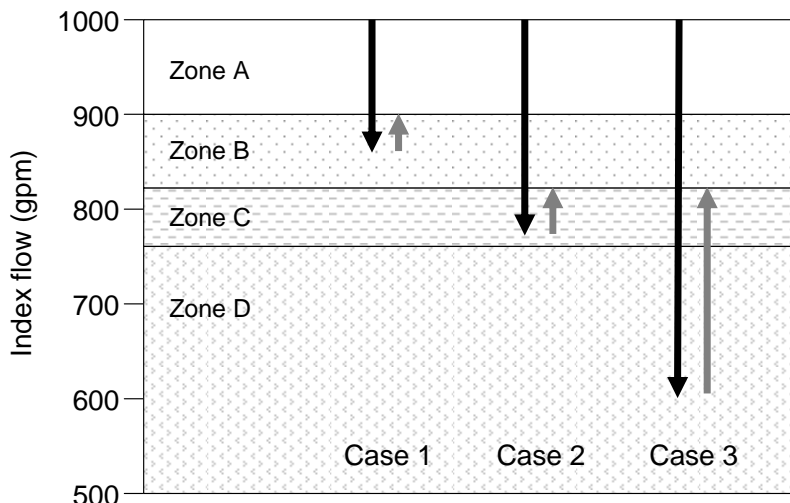
Sec. 32706e. The department shall determine whether an adverse resource impact has occurred under this part and whether a withdrawal is a zone A, a zone B, a zone C, or a zone D withdrawal under this part based upon cumulative withdrawals affecting the same stream reach. In accounting for these cumulative withdrawals, the department shall apply both of the following:

- (a) Beginning on October 1, 2008, the department shall begin water withdrawal accounting for cumulative withdrawals affecting the same stream reach.
- (b) Beginning on February 1, 2009, the department shall adjust the water withdrawal accounting under subdivision (a) such that if cumulative withdrawals beginning on October 1, 2008 have removed a sufficient flow of water from a stream reach to change the zone classification of that stream reach, the department shall reset the water withdrawal accounting benchmark for that stream reach as follows:
  - (i) If the cumulative impact of withdrawals on February 1, 2009 results in a classification as a zone B withdrawal, the accounting benchmark shall be reset at the beginning point for zone B withdrawals.
  - (ii) If the cumulative impact of withdrawals on February 1, 2009 results in a classification as a zone C withdrawal, the accounting benchmark shall be reset at the beginning point for zone C withdrawals.
  - (iii) If the cumulative impact of withdrawals on February 1, 2009 results in a classification as a zone D withdrawal, the accounting benchmark shall be reset at the beginning point for zone C withdrawals. If there is not a zone C for the classification of the stream reach, the water withdrawal accounting benchmark shall be reset at the beginning point for zone B withdrawals.

Effectively this means water that was actually withdrawn from the watershed is added back in the water accounting system. Figure 3 illustrates how this adjustment works using several hypothetical examples. The initial condition, before any new withdrawals are made in the watershed, has an index flow of 1000 gpm. The following cases are illustrated:

- Case 1 A total reduction of 140 gpm from the initial condition and the required adjustment back to the top of the B Zone.
- Case 2 A total reduction of 220 gpm that places the withdrawal into the C Zone, this would be adjusted back to the top of the C Zone.
- Case 3 The total reduction from the initial condition is 400 gpm, placing the withdrawal into the D Zone – likely causing an Adverse Resource Impact. In this case the flow account would be adjusted back to the top of the C Zone. Note, it does not matter how far into the D Zone the streamflow is depleted, the adjustment will take it back to the top of the C Zone. The next withdrawal in this watershed will trigger a site specific evaluation.

Figure 3.—Several hypothetical examples of adjustments to the water accounting system. Examples of sequentially higher withdrawals (black down arrow) and the resultant river flow account adjustments (grey up arrow) are shown in cases 1-3.



Only a limited number of stream segments will be affected by this provision. As of March 1, 2009, 37 new large capacity withdrawals installed during that period have been reported to the DEQ. The final tally of new large capacity wells installed between October 1, 2008 and January 31, 2009 will not be known until April (past the date for preparation of this report). Of these 37 withdrawals, accounting adjustments are required in 9 cases (see Figure 4). The results are summarized in the two tables below. The first (Table 7) contains six streams where the adjustment moves the available water back to the beginning of the B or C zone from somewhere in that zone. The second (Table 8) contains those streams where the proposed streamflow depletion would likely cause an ARI based on the tool determination. Cold-transitional streams are affected differently than the other stream types. This is because cold transitional streams start in the B zone (no Zone A), therefore, any depletion must be adjusted. The first cold transitional stream has a very minor depletion of 7 gpm, less than 10% of the allowable depletion before causing an ARI. The Screening Tool determines that the withdrawal in one watershed is likely to cause an ARI in the neighboring second cold transitional stream (see Table 7). The required adjustment causes the DEQ to not recognize possible ARIs identified by the Screening Tool.

The total adjustments shown in Table 7 are relatively small compared with the allowable streamflow depletion prior to causing an ARI. We note that the most sensitive stream type (cold transitional) would have been automatically adjusted back to the point where there is no withdrawal accounted for in the watershed, because there is no A Zone--the initial zone is B.

Table 8 identifies three watersheds where likely ARIs will be ignored until the next user registers. At that time, a site specific review will be required. There are currently no widespread or large problems identified because of the required adjustments. If any significantly different results arise when the final withdrawals through January 31, 2009 are evaluated, a short report will be issued to address these.

Figure 4.–Locations of Large Capacity Withdrawals installed between October 1, 2008 and January 31, 2009.

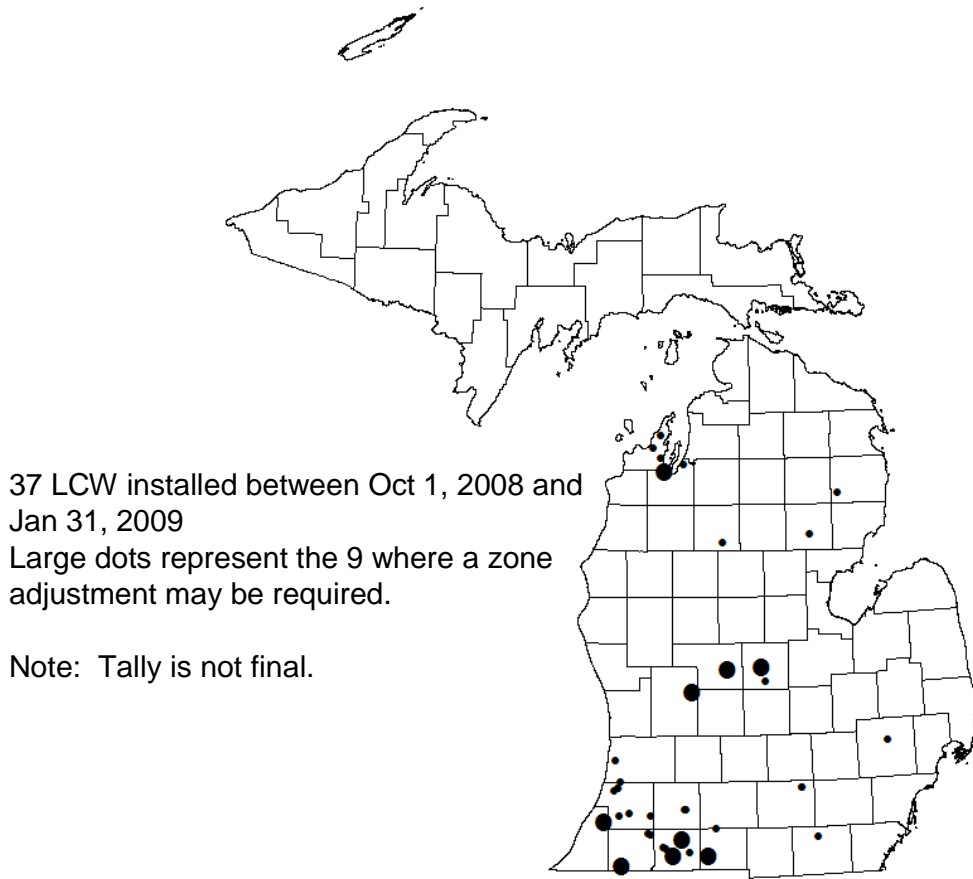


Table 7.–Summary of river flow account adjustments from B or C zones, due to the initial phase-in provision.

<b>STREAM TYPE</b>	<b>DRAINAGE AREA (sq mi)</b>	<b>INDEX FLOW (gpm)</b>	<b>Allowable Depletion before B or C Zone (gpm)</b>	<b>SOURCE DEPLETION (gpm)</b>	<b>Allowable Depletion before ARI (gpm)</b>	<b>SOURCE ZONE</b>	<b>Feb 1 Adjustment (gpm)</b>
Cold transitional stream	29	3865	0	7	78	B	7
Cool stream	10	2684	81	113	335	B	32
Warm stream	30	2137	107	153	256	B	46
Warm stream	15	3350	167	178	402	B	11
Warm stream	29	4953	248	279	594	B	31
Cold stream	8	433	30	39	43	C	9

Table 8.—Summary of river flow account adjustments from likely Adverse Resource Impact (Zone D), due to the initial phase-in provision.

<b>STREAM TYPE</b>	<b>DRAINAGE AREA (sq mi)</b>	<b>INDEX FLOW (gpm)</b>	<b>Allowable Depletion before B or C Zone (gpm)</b>	<b>Allowable Depletion before ARI (gpm)</b>	<b>SOURCE DEPLETION (gpm)</b>	<b>SOURCE ZONE</b>	<b>Feb 1 Adjustment (gpm)</b>
Warm stream	7	1092	98	131	156	D	58
Warm stream	20	2037	183	244	303	D	120
Cold stream	69	15375			39	A	
* Neighbor stream: Cold transitional stream	14	1455	0	29	99*	D*	99*

### Conclusion and Recommendations

The WRCAC has overseen the initial implementation phase for the Water Withdrawal Assessment Screening Tool (October 1, 2008 through March 31, 2009). We conclude the Screening Tool currently provides an effective statewide program tool and carries out the appropriate screening function. Michigan’s various water user sectors have shown a high level of interest in the Screening Tool. Their suggestions have led to many technical improvements to the tool and we expect the level of public engagement to continue to grow.

The Screening Tool is ready for full implementation on July 9, 2009. But as we endorse this launching of the Screening Tool, we also emphasize that continued refinements must be expected in response to needs identified by user publics and state agency developers. We recommend that such refinements be explicit in both short and longer-term planning for tool maintenance. In this spirit we have two recommendations for technical at this time:

- 1). To protect against upstream withdrawals causing downstream ARIs, we recommend that, consistent with the terms of Part 327, the screening function be extended to account for Cold-Transitional segments downriver of Cold segments. This should be implemented immediately.
- 2). To best align the scale of the statewide Screening Tool with the on-the-ground scale of policy decisions, we recommend that, when possible, all aspects of the WWAP be moved to the 1:24,000 map scale.

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(Published Documents supporting the WWAP are in **bold font**.)

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## APPENDIX 1. Initial internet use of Screening Tool and feedback from online users

The law creating the Water Withdrawal Assessment Screening Tool took effect on July 9, 2008, with a requirement to make it available for testing and evaluation on October 1, 2008. This short time frame meant that the initial on-line version was still a “draft” and the developers continued work to finalize it.

There is strong public interest in the Screening Tool. Interested parties immediately began testing it on-line for many conditions, in every part of the state. The website includes a “feedback button” to provide comments. Users had a wide range of experience in geographic information systems (GIS) products, from none to expert, which led to many excellent suggestions about how to meet their varied needs. Users quickly found problems the developers already knew about, and more; developers responded promptly to upgrade functions within the tool.

From its debut on October 1, 2008 until March 19, 2009, about 3,270 unique visits were made to the Water Withdrawal Assessment Screening Tool internet site. These unique visits are calculated through a cookie (a small parcel of text that is exchanged between the server and the client’s computer) and include both first time visitors and returning visitors. This is about 545 per month. About 34% of these were return visits. Current tracking indicates that over 20% of the users spend over an hour using the WWAT.

The Department of Environmental Quality, Water Bureau (DEQ WB) received 39 comments from the “feedback button” between October 1, 2008 and January 31, 2009. The DEQ WB provides individual responses to each comment. These are updated monthly and posted on the website. They can be viewed using the “FAQ” button in the Information Window at: <http://www.miwwat.org>. User comments are organized into four categories: 1) *Improving Functionality*, 2) *Screening Tool Operation*, 3) *Questioning Site-Specific Application*, and 4) *Questioning the New Legislation*. Each category is fully described below, including a description of how comments are generally addressed.

1) *Improving Functionality*. Comments are placed in this category if they deal with appearance of the tool, navigation of the website, or how information is displayed. Simple corrections are made immediately.

For example, some suggested that the tool should use the “ground water withdrawal” option as the default, since ground water withdrawals represent the clear majority of large quantity withdrawals. This change was implemented. Additionally, a number of comments identified relatively simple errors, such as: typos in the screen displays, misprinting of reports, and failure to include important information in printed reports. This included the failure to include days, hours, and months in reports for intermittent withdrawals. Screen- and report-content are modified continuously, based on such comments.

Many comments related to website navigation. Improvements were made by providing better access to information, such as “pop-up” instructions to assist users in site navigation.

Some comments reflected a lack of familiarity with GIS, which can be a hindrance to operating the tool. Users requested more direction for navigating and retrieving information from the GIS foundation of the website. One person deduced that the “little red dots” on the map are wells. However, s(he) did not know how to access the well-specific database by using the “identify” button on the GIS Tools menu, nor how to make the layer active, which is necessary in order to view the well information. Additional instruction will be added to assist those not familiar with navigation around GIS.

Some comments identified functional flaws in the Screening Tool interface. Such comments are being addressed with ongoing edits and improvements. These include:

- The absence of a “back” button to return the user to previous screens or directly to the homepage;
- The need to retype information when starting over on a query;

- The failure of the Screening Tool to properly execute queries (e.g., it could not find an address); and
- The presentation of information in a standardized format. It was noted by numerous users that the entry of latitude and longitude was reversed, and these units should default to degree-minutes.

Numerous comments expressed a desire to see additional educational materials on the website. Specifically, users wanted a description of the fish response curves, and information on how the 11 stream habitat types were developed, including explanations of characteristic and thriving fish populations for each. A response is being developed for the educational section of the Screening Tool.

- 2) *Screening Tool Operation.* These complaints often identified a “fatal flaw” causing the Screening Tool to operate very poorly, or not at all.

A few users identified a failure of the Screening Tool to operate, due to the overlap of choices on the GIS menu. In these circumstances, some buttons used to activate various GIS functions were not accessible. The problem was identified as a browser-specific issue, mostly related to the default screen resolution provided by the browser. This problem was fixed by the addition of a “scroll bar”, providing access to all functions and tools, masked or unmasked.

More difficult corrections are being made in an ongoing, step-wise fashion. For example, there were complaints when attempted map navigation defaulted to an area outside of Michigan. Any attempt to execute further commands, including a return to Michigan, caused the Screening Tool to slow considerably and, at times, cease operation. The technical team concluded that these problems are another browser-specific issue. The Screening Tool is believed to work best with Microsoft Internet Explorer. The browser that appears to be experiencing the greatest frequency of problems is Firefox. Work is ongoing to address these browser compatibility issues.

Several users questioned why they received a negative outcome at one location, but a pass at very nearby locations. These problems were traced to the erroneous assignment of a “zero flow” to some extremely small river segment drainages. All such drainages were identified and their flow data corrected.

Some individuals found the Screening Tool to be completely non-functional. It was concluded that most of these situations existed when users failed to disable pop-up blockers in their internet browsers. Pop-up screens are necessary to execute GIS functions within the Screening Tool. A warning was added at the very start of the process, reminding users to disable their pop-up blocker. The warning includes a link to instructions on how to disable the blocker for various browsers.

- 3) *Questioning Site-Specific Application.* One set of comments questioned the applicability of the Screening Tool to a specific location. For example, the Screening Tool can estimate that a given stream will experience a significant withdrawal impact when the user has local hydrogeologic information suggesting something different. The user may then assert that local geology provides significant hydraulic separation between the wells and streams in the area. This discrepancy can be explained and managed, as follows.

There are some simplifying assumptions necessary for development of a statewide Screening Tool, and the presence of a connection between aquifer and stream is one of those assumptions. The technical team recognizes that there are localized exceptions to this generalization, and that this fact will often draw criticism. We emphasize that what we are presenting is, by definition, a “screening” tool built to provide program efficiency. When a proposed withdrawal fails the screening process, the subsequent site-specific review will examine the very important element of the local connection between aquifer and adjacent streams.

The Screening Tool is also criticized because the model does not take into account aquifer confinement or aquifer type. This level of geologic detail is not available for a statewide model. However, the degree of connection in all calculations is tempered by computed values for vertical hydraulic conductivity from the well record information in the Groundwater in Michigan (GWIM)

database. Again, in cases where the proposed withdrawal does not pass the Screening Tool, the validity of computed values and the resulting degree of aquifer connection would be evaluated as a central part of the site-specific review.

Additionally, reviewers criticized the lack of information on the website as to how the tool operates. Expressing disbelief at the outcome of various tool runs, it was stated that:

- All assumptions made by the tool should be clearly identified for all to see;
- Information should be provided on all the input variables to the Screening Tool;
- The tool should provide a specific reason for the failure of a proposed withdrawal to obtain a pass; and
- The tool should cite reasons for assigning the withdrawal to policy zone C or D.

The Screening Tool consists of a GIS interface and the interaction of three distinct models dealing with stream flows, stream depletion calculations, and fish population characterizations. Information on the development and operation of the Screening Tool and the three models, including the publication of professional articles, are either published or under development and will be made available as soon as possible. In all instances, the reason for classification to a particular policy zone is due to the predicted depletion of water from a stream segment being greater than the established amount available for withdrawal.

Access to all available documentation is provided via the Screening Tool website at [www.miwwat.org](http://www.miwwat.org) or the state Water Resources Conservation Advisory Council website at [www.michigan.gov/wrcac](http://www.michigan.gov/wrcac).

Some comments expressed strong concerns that the Screening Tool mischaracterized an area with which the user was familiar. In at least one instance, the user characterized the area as “environmentally sensitive” and concluded the large withdrawal that passed the screening evaluation would be disastrous. However, reexamination of underlying data sets and other relevant information allowed the technical team to conclude that the area was, in fact, appropriately characterized. It possessed a wealth of surface water and ground water resources, capable of sustaining very large ground water withdrawals.

A few comments questioned whether bedrock and drift aquifers were handled differently. They are treated very differently, so this highlights a need for better access to key background information. The background information being supplied through the web-site will better explain this.

Finally, there was often a misunderstanding of the new legislation that lead to a misconception about how the tool operates. For example, one individual pointed out that there were no trout streams in their area, so essentially all proposed withdrawals should pass. This was cited as an error in the river classification map; however, in this instance, the user failed to realize that the new law was intended to protect all streams and not just trout streams.

- 4) *Questioning the New Legislation.* Various comments were made questioning the appropriateness of the water withdrawal legislation. Most questions were regarding the handling of “baseline capacity” and return flow in the new legislation.

The treatment of baseline capacity, water use, unused baseline capacity, and return flows are subjects of considerable debate and the WRCAC is currently tasked with investigating and recommending to the legislature how these issues should be addressed in future legislation.

## Appendix 2. WWAT Survey Questionnaire Results

Average return rate for all nine workshops = 50.6%

<i>Date (2008-09)</i>	<i>County</i>	<i>City</i>	<i>Registered Participants</i>	<i># of surveys returned</i>	<i>% of attendees returning surveys</i>
Nov 14	St. Joseph	Centreville	35	23	65.7
Dec 4	Montcalm	Howard City	59	11	18.6
Dec 8	Macomb	Clinton Twp	35	26	74.3
Jan 19	Lenawee	Adrian	24	15	62.5
Jan 20	Grand Traverse	Traverse City	12	5	41.7
Jan 22	Ottawa	West Olive	45	18	40.0
Feb 2	Grand Traverse	Traverse City	12	6	50.0
Feb 5	Ingham	E. Lansing - MSU	20	11	55.0
Feb 13	Genesee	Flint	25	12	48.0

### 1. How well do you understand the water withdrawal assessment process?

<i>Not at all</i>	<i>*</i>	<i>somewhat</i>	<i>*</i>	<i>Very</i>	<i>n/a</i>
0%	0%	17%	53%	29%	1%

#### Comments:

- Know about it but have not seen it.
- Great overview - concise and clear.
- Easy to listen to speaker.
- Good concept.
- Great presentation! Clearly stated and easy to understand.
- Dave did a great job going thru background information necessary for understanding issues.
- This is something that has taken a few times sink into my head. This session was very helpful in building my knowledge a few additional levels.
- Need to review further to see how the tool works in multiple areas of the state. Limited # of measure points 142 seems marginal
- I'd like expanded information on any impacts to public and private water use systems.
- Straight forward and easy.
- The training was very detailed. I appreciated the policy history.
- Excellent program.
- Good meeting.
- Impressive how several databases were used to create assessment tool.
- Dave did a nice job of explaining.
- Very good and thorough presentation.
- I understand how to use it and have a pretty good understanding of the process used to put it together.
- Very well explained.
- Does the tool work well for shallow < 30' water depth? We have a lot of wells from 15' to 32'; does it work for this?
- Hands on would be better - computers need to be tested before booking the location.
- Learned a lot today.
- Pretty well.
- I recognize the value of setting levels of no exceedance and I commend the team for developing this tool. However, we absolutely need to continue the evaluation and monitoring process through time.

**2. How well do you understand the reasons for using the Screening Tool?**

<i>Not at all</i>	*	<i>somewhat</i>	*	<i>Very</i>	<i>n/a</i>
0%	1%	13%	40%	45%	1%

Comments:

- I understand the importance of managing this resource that everyone needs or wants for their agenda.
- Good current legislative overview- w/just enough background information.
- Former chairperson of River Raisin Watershed.
- It is imperative that we not only protect resources, but protect the individual’s rights without removing an individual water property right.
- I believe its for new wells not pre-existing wells prior to Feb 2006/07.
- Both speakers were very clear and to the point.
- To guide planning & water use.
- Yes.

**3. What are your initial reactions to this Screening Tool?**

<i>Not at all</i>	*	<i>somewhat</i>	*	<i>Very</i>	<i>n/a</i>
0%	2%	24%	39%	32%	2%

Comments:

- Easy to use for most, some have trouble, pretty tool.
- Good, generally I found out that if you go to bedrock, it would be ok, no impact.
- It's a great start. The more information of data is available the better it will be.
- Long time overdue.
- Very useful tool even if you are not doing a withdrawal assessment.
- Model assumptions were thoroughly explained and limitations are inherent, but seem to be based on best available data.
- Good approach.
- Looks like it needs some refining and ground truthing.
- It will need tweaking.
- Much better than prior to the class. I understand the regulations more clearly and the background behind them.
- Seems like an efficient way to eliminate any needless sweat on the part of DEQ personnel with the new rules in place.
- This tool could have been a very complicated and intimidating tool. However, I found the tool was easy to use. This is very impressive.
- Not sure what to expect.
- Simplify's recording - less paper.
- If people don't know how to use the internet, how will they benefit or know how to use this?
- Concept is great; it appears that there is a great deal of well data missing.
- I think it’s trying to turn something gray into black and white and all you get is gray.
- I tried it before the workshop w/o instructions and did not understand it totally.
- I registered a well today!
- What would stop someone from submitting multiple requests for a certain watershed and stopping the use of the online tool for that watershed?
- Needs to consider groundwater impacts.
- Potentially excellent, if it works.
- Well done!
- It is a good start, but there should be additional factors considered in addition to temp, flow, and fish.

- Concerned about cumulative impacts; definitely want to see periodic assessments and improvements to models based on monitoring.
- Would like to use it as a evaluation tool for stream surveys.

**4. Was the Screening Tool easy to navigate and use?**

<i>Not at all</i>	*	<i>somewhat</i>	*	<i>Very</i>	<i>n/a</i>
0%	3%	25%	46%	25%	1%

Comments:

- I have worked w/groundwater mapping project viewer and this is similar to that and was easy to get around.
- Occasionally locks up.
- Windows based and have lots of experience with graphics and other software.
- Computer seemed to lock up.
- Slow retrieving data.
- Query function seemed to have problems - trouble picking criteria, not very clear to operate.
- Aerial wasn't appearing in Washtenaw County near I-94 & US-23
- Need more time on practice.
- Does not work well with slow connection.
- Found performing a new registration easy, but to research a new one seemed not seamless to navigate back to the beginning.
- The IMS viewer is slow and error prone if someone issues two commands without waiting. I am not sure if other web apps might be used for the viewer, but they should be looked into; if such application can handle the data that ArcIMS can.
- Novice computer person.
- For the most part, it was pretty straight forward.
- Can master it fairly quickly
- Even a caveman could do it.
- Did not attend screening tool practice.
- For being brand new and me mostly computer illiterate I am happy.
- Somewhat slow and sometimes had to click icons several times to get them to work.
- No back arrow.
- Yes, as far as it went today.
- Would like to have used it in lecture/ could not due to firewall.
- Due to technical difficulties, we were unable to use tool ourselves.

**5. How familiar are you with GIS?**

<i>Not at all</i>	*	<i>somewhat</i>	*	<i>Very</i>	<i>n/a</i>
8%	14%	33%	31%	13%	0%

**6. How confident are you with the outcome generated by this Screening Tool?**

<i>Not at all</i>	*	<i>somewhat</i>	*	<i>Very</i>	<i>n/a</i>
1%	8%	37%	40%	13%	2%

Comments:

- Just need more data, but it is a great start.
- I am hoping you get everyone to register - good luck on that.
- I understand the generalizations being made and extrapolation procedure.
- This needs more records (data).
- Errors on the side of caution, which is a great thing.
- Several wells in the area I used as test site were missing.
- Using the tool is one thing. Understanding the outcome may be difficult.
- This is still too new for us to know if it is the proper tool.
- Based on statistic sampling only on 142 points statewide needs to be shored up scientifically in my opinion.
- I need to learn more about the assumptions and "writers privilege" that were used.
- I have taken an Intro to GIS course.
- Within limits of assumption & approximations built into the tool.
- Wish we could combine ability of aquifer w/this tool.
- Looks relatively easy to use.
- Good alternative to have site specific visit.
- Compliance is a concern.
- This could be looked at in a variety of ways in terms of the hydrological component. I'm fairly confident.

**7. How well do you understand your options if your initial request to withdraw does not pass?**

<i>Not at all</i>	*	<i>somewhat</i>	*	<i>Very</i>	<i>n/a</i>
2%	5%	23%	44%	25%	2%

Comments:

- However, not applicable - don't foresee myself using it, but want to be familiar w/tool if and when I interact/work w/people who will use it.
- It seems you can modify your well data options if you still fall in the C/D range. You can still put it in if a DEQ visit says ok?
- Just going back and forth a little bit and rerunning the tool was very helpful.
- Explained very well.
- Site specific.
- Talk to Dave and/or his staff.
- Would like more details on this process.
- See Dave.
- Blocked by firewall at site.

**8. What is the likelihood that you may use the Screening Tool in your work?**

<i>Not at all</i>	*	<i>somewhat</i>	*	<i>Very</i>	<i>n/a</i>
2%	9%	21%	34%	30%	4%

**9. What is the likelihood that you will use the Screening Tool in your work?**

<i>Not at all</i>	*	<i>somewhat</i>	*	<i>Very</i>	<i>n/a</i>
4%	16%	24%	25%	27%	3%

**10. What is the likelihood that you will not use the Screening Tool in your work?**

<i>Not at all</i>	*	<i>somewhat</i>	*	<i>Very</i>	<i>n/a</i>
49%	18%	10%	10%	5%	8%

**11. What is the likelihood that you will tell other about the Screening Tool?**

<i>Not at all</i>	*	<i>somewhat</i>	*	<i>Very</i>	<i>n/a</i>
1%	3%	12%	34%	47%	3%

Comments:

- I am a manufacture rep. I will let my dealers know about this tool.
- I believe it is a value for everyone - we all need to be aware and more responsible with water use.
- I am not in a position to perform an assessment, but will use the assessment for well permitting and depth to bedrock.
- See above comment.
- Depends on clientel.
- Our office (Huron Clinton Metropark) will definitely use the tool!
- I haven't had to use the tool yet, but I am sure that in the near future I will be sharing information about the tool with clients and people in my program area.
- Being a water systems supplier, this tool is intimately involved w/ the future of my business.
- If my nursery succeeds, I will expand and will use this tool.
- Current economic: we are downsizing and may not have the opportunity to use the tool.
- I will be engaging the tool in the next year.
- This does not apply to me.
- I need to spend more time to evaluate specific sites and potential impacts on resources other than stream fisheries.

**12. Changes to the tool are**

<i>Necessary</i>	<i>Not Necessary</i>	<i>Not sure</i>
31%	11%	55%

Comments:

- There are uncertainties that will come out with time. Have not used it in real instances to be sure that changes do not need to be made yet.
- Updates, more irrigation wells.
- No changes needed for my company's current use of the tool.
- As you get data, you can make changes as needed.
- At this point, only to work bugs out of system.
- Minimal changes are always necessary when using software.
- Any tool/model requires monitoring and tweaking w/changes conditions.
- Updating well locations as time goes on to assure me all the necessary information is in the calculations.
- Aerial photo did not match reality. I'd say 1/2 mile N + 1/2 W off.
- Working out bugs.
- Improvements can be made.
- Refinement and ground truthing the maps and type of streams/rivers etc.
- More information will come in.
- Include additional wells; browser speed can be quite slow "retrieving map"; include lake water withdrawal.

- After hearing about how the tool models its decisions, it seems as though it is up to the task at hand. Improvements in accuracy and user interface are always welcomed though.
- I would say perhaps when the model is run w/a capacity of less than 70 gpm, that a result will be returning that would indicate that this capacity does not need to be registered.
- W/the limited amount of information used to determine biologic impact it must evolve.
- Get more up to date Aerial Photos w/higher resolution.
- Tie in all irrigation wells, too and water quality.
- I'm not sure I understand this. As of now, I don't see any changes needed. However, if they arise, I do think changes should be implemented.
- Add the cumulative effects of farral wells in a well field.
- Need to be able to plot multiple wells in order to determine total impact.
- Should be easier to navigate map e-w & n-s.
- Databases will continue to expand.
- With a guide, use for the first time, it seems to have the need to search easier w/o an address - not sure what this is, but will have some idea once used more.
- Update of watershed information, modification of registration to as- built installation.
- Registrations need to somehow tie back to the well logs in Wellogic, especially if Wellogic is a resource for WWAT.
- Varying usage by month.
- For me.
- Eventually, as groundwater conditions change.
- Need to use it more.
- I expect the tool will be evolving.
- What I have seen to date is that the tool is working. Yet, in site specific areas I question the accuracy of the tool.
- A notification that a request went through the tool/acknowledgement that it was received.
- I would need more experience with the tool.
- Need to have more exposure to tool.
- Have not spent enough time.
- Small stream flow data of existing conditions not accounted for.
- Would connect to previous tools, GW tool and well logs.
- The model needs to be continuously updated over time to address currently identified issues or weak spots and new issues as they arise.
- Other data should be considered - what will happen with long term and short term flow fluctuations which are important to stream systems.
- Overtime, wetlands and other riparian habitats need to be evaluated in the process.
- Key to tool applicability and utility to protect resources will be flexibility in its development through time and that reporting and compliance are enforced. That said, I do believe this tool is a good step in the right direction.
- I could provide more once I've spent more time gaming it.

### **13. What water use sector do you represent?**

Agriculture - 21  
 Agriculture Irrigation - 5  
 Health Department - 2  
 LWQ - 1  
 None - out of state  
 Home Owner/Small Farm - 1  
 Local Government - 3  
 County Government - 5

Private homeowner - 1  
 Government - 2  
 Less than 70gpm - 1  
 Local Health Dept. - 4  
 Private & Township - 1  
 MI Groundwater Stewardship Program - 2  
 Turf Farm - 1  
 Public Water Supply & Irrigation - 1  
 Public - 1  
 River Raisin Watershed – 1  
 Consultant - 7  
 Well Supply - 2  
 Public Education - 1  
 Municipal/ Drinking Water Systems - 4  
 Municipal Site Development - 1  
 Non-Profit - 1  
 USDA- NRCS / Planning Commission - 1  
 Groundwater - 1  
 MSUE - 2  
 Regulation - 1  
 Well/Land Owner - 1  
 Conservation District - 1  
 Water Well Contractor - 1  
 Environmental Protection/Advocacy/Education - 1  
 Industrial and Agricultural - 2  
 Industry - 6  
 Private - 2  
 User - 1  
 Research - 1  
 Educational for Farmers - 1  
 None - 1  
 Golf Course Maintenance - 1  
 Tribal Natural Resource/Gov - 2  
 Fisheries/Wildlife Manager - 2

**14. Were there specific problems encountered when using the Screening Tool?**

Yes 27 (31%)                      No 59 (69%)

Please provide details about any problems you encountered in the sections below.

***Entry screens and finding your location:***

- ok
- Good
- Easy
- Coordinates listed as (long,Lat) Maybe should reverse, and list as latitude first, then longitude.
- Had trouble inputting latitude longitude.
- Easy to use.
- Straight forward, easy!
- Great!

- No good w/computer.
- Need to be able to print out attribute data from site.
- Could not find specified street address.
- We had a hard time initially locating our section, but no big problem.
- Fairly Easy.
- Could not make it load.
- Firewall limitations on access/use of tool
- U of M computers blocked access
- Firewall encountered

***Help screens:***

- Ok.
- Didn't Use.
- Seems a little lacking.
- Easy to understand.
- Straight forward, easy!
- n/a
- Would be helpful if it showed "why" it would not accept a command (e.g. aerial photo - need to zoom in more).
- Didn't use.

***Navigation issues:***

- Ok.
- General photo came up small after maximizing screen to full size. This will be a problem, because most users will maximize screen after they see the initial size of the map.
- Solid.
- Aerial photos not working correctly.
- Larger maps to ease viewing.
- Very easy.
- Easy.
- Great.
- Other than slow computer!
- Hard to get Aerial Photos to show up. Slow to refresh map.
- Not intuitive.
- Need a better "back" button - Problems w/aerial, have to zoom way in.
- Over load system.
- None

***Entering your withdrawal options:***

- Ok.
- Good.
- Easy, but when I go back to change the inputs - I would like to see the original or last inputs I used to run the model – it always goes back to 25-ft for well depth.
- No issues.
- Add lakes and/or intermittent surface water i.e. golf course irrigation from streams.
- Quick – informative.
- Easy.
- Need to allow for multiple well locations to determine total impact.
- Pretty Easy.
- Ability to run two close withdrawals. Example two 300 gpm wells on a new site.
- I don't know much about how much water is typically withdrawn for different uses.

***Zone outcome screen:***

- Ok
- Ok
- No problems, informative.
- Loved it - very detailed.
- Would be nice to see the name of the stream.
- This is awesome, great job!
- We passed with continuous use, but failed w/intermittent use.
- Easy.
- List the streams your withdrawal is impacting by %.

***Registration screen:***

- Ok.
- Didn't have to use, but seemed ok.
- Did not access.
- Have not done this yet.
- Not complicated at all.
- Don't know - didn't register a well. I assume that it is straight forward.
- Good.
- Did not look at.

***Other comments:***

- Aerial photo matching road layout.
- Times out for WWAT.
- Simple functions - aerial didn't appear, trouble w/query.
- Inputting Longitude and Latitude.
- Some data not matching up with reality.
- Missing data - well information.
- Speed of map retrieval.
- Error response from the previous requests not received upon this popup, the viewer sometimes needs to be reloaded.
- Wells missing from site.
- My lack of computer skills hinder me.
- Getting use to it and wrong information on existing wells.
- System was slow due to many users at once.
- Slow, but many individuals were on server at the time granted it has many permutations.

**15. Please add any other comments or suggestions related to the water withdrawal assessment process and Screening Tool:**

- None at this time.
- I am very concerned with water use in St. Joseph County. We already use a lot of water. I feel we need to be more responsible with water use.
- It was mentioned that the query builder will have more user friendly names (in selecting query parameters). Please make the names simple and straightforward for the general public.
- Nothing came up today- but as I use it more frequently, I will be sure to send feedback.
- It's amazing that we have the database to support this, it is a step in the right direction
- Thanks for the workshop!
- It would seem to me exiting and grand father wells should be in database.
- I may use the tool more for finding other information, depth to bedrock, watershed name etc. - aerals are newer than some current applications.

- Won't use tool much.
- No problems in using the tool.
- Existing well information seems limited and difficult to read. Would be nice to be able to pull up report similar to GW map.
- Inventory well drilling.
- I will share information with any agency interested. They can do follow up with additional questions to DEQ.
- I think that some Ag users may feel like they need to register their use regardless of capacity just so they cannot be found later to not be in compliance and just to cover their bases. For those under 70 gpm, unless you still want these users to register, perhaps a message can pop up to indicate registration not necessary.
- Overall, really nice tool. I'm a little apprehensive about the accuracy of the results, but if this is what the regulatory agencies will rely upon, it shouldn't be an issue.
- Please add links to all the data in for the state.
- I think there may need to be more workshops to generate use of this tool. You may ask attendees at these workshops to invite their colleagues that didn't attend to participate another one.
- I need practice.
- Very useful tool.
- Almost too easy - Great Work!
- How will updated material/information be added?
- People in general need to understand the impact of the legislation a cumulative water use for a parcel. It's easy to see a 70gpm well, but not 5 wells totaling 70gpm.
- We have 3 groundwater wells on our farm, but only 1 shows as existing. We have reported usage and capacity to the MDA since, I believe 2005.
- Good and helpful presentations.
- How do we unregister a well? If it was put in by mistake or if you would like to change location due to the well driller preference.
- I found it surprisingly easy to use and look forward to using it in the future.
- Great Tool!
- I look forward to playing around with the tool in the future and working with users.
- Could not use it at U of M because of firewall, will try at home.
- Overall Seminar was helpful to clarify reason for the tool and how to use it.
- Good overview - thank you!
- Firewall at site would not allow certain actions.
- What about a function for deleting accidental registered withdrawals?
- I think in time fisheries data may need to be incorporated into the real time data. Drought, conditions and management need to be incorporated.
- Keep tribes closely involved in future refinement of the tool and informed about MDNR Fishery and Wildlife staff concerns related to particular withdrawal proposals. Also, we need to address the "value" of water. Blend protection of a public resource w/ the application of a financial cost born by the commercial user. Plug funding back into the resource.
- I attended this meeting largely to get some input on the link to fisheries and what assumptions were used in designing the fish curves; therefore, I didn't focus too much on the tool itself. I may not provide the best input into how the online tool is functioning because I haven't reviewed it in detail.