



Is Your Irrigation Water Supply Adequate

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[https://www.canr.msu.edu/
irrigation](https://www.canr.msu.edu/irrigation)





Black Buck Barney,

He needs to go to a breeding farm with lots of does so he's not board.

Do not let him get loose or he will go to the neighbors and get in trouble.

Limit his feed or he will get sick....or get too fat to do his job.

If he gets loose, you can return him to Farm, Orland, IN.



Lyndon Kelley

He works for MSU or Purdue Extension ... Which ever will claim him.

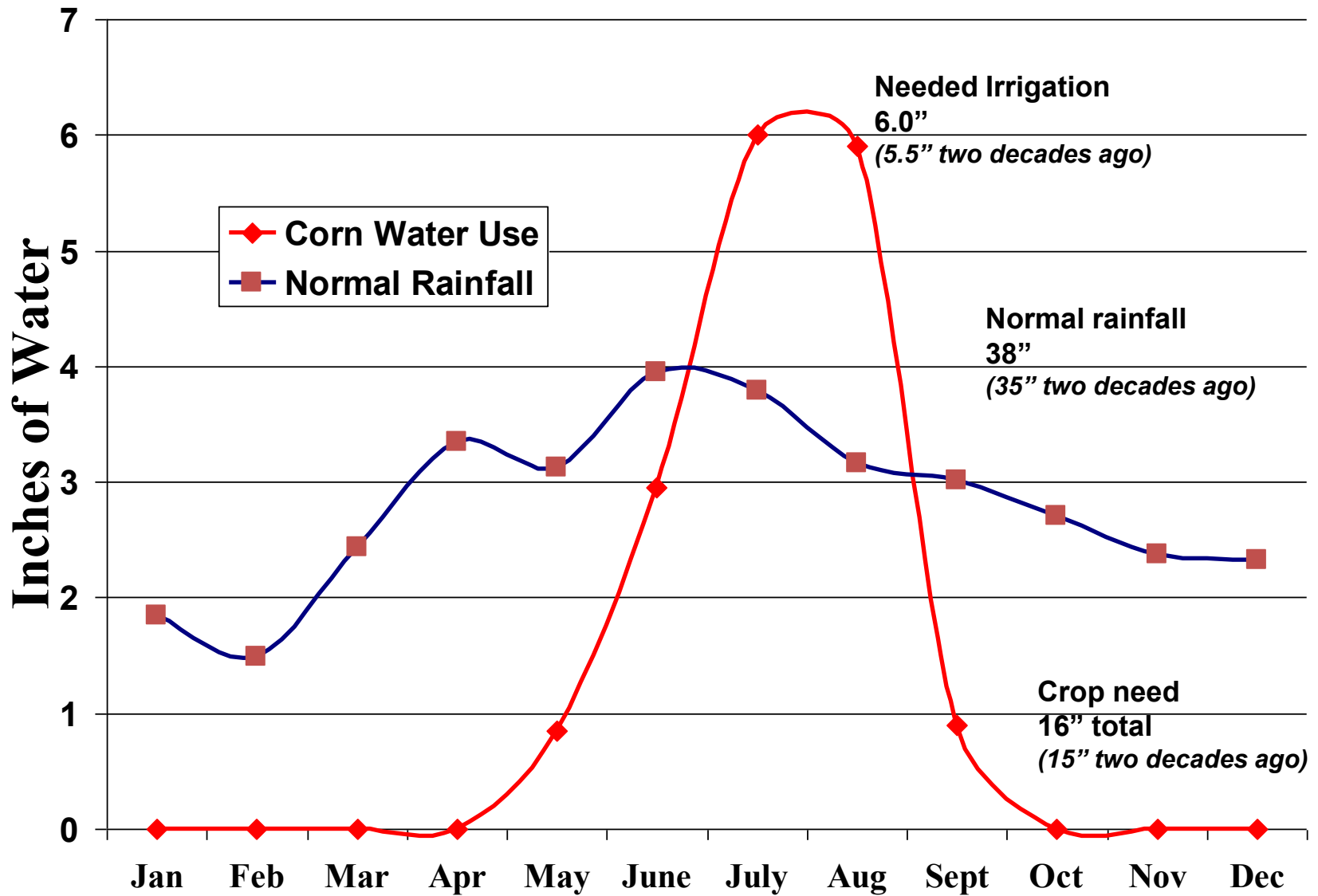
Do not feed him... he is already a little too fat.

Do not let him wander off his irrigation topics... or he gets in trouble.

If he is in trouble, return him to the closest Extension Office.

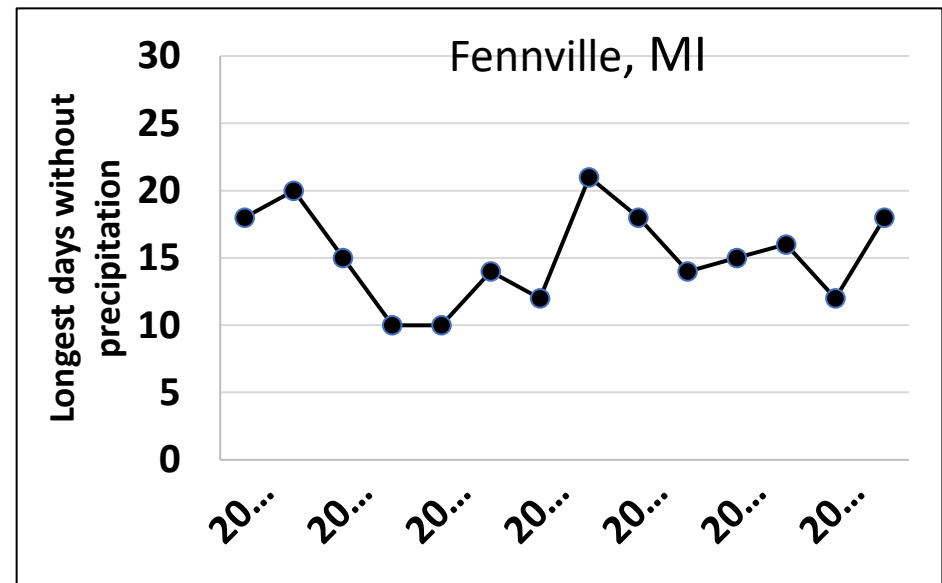
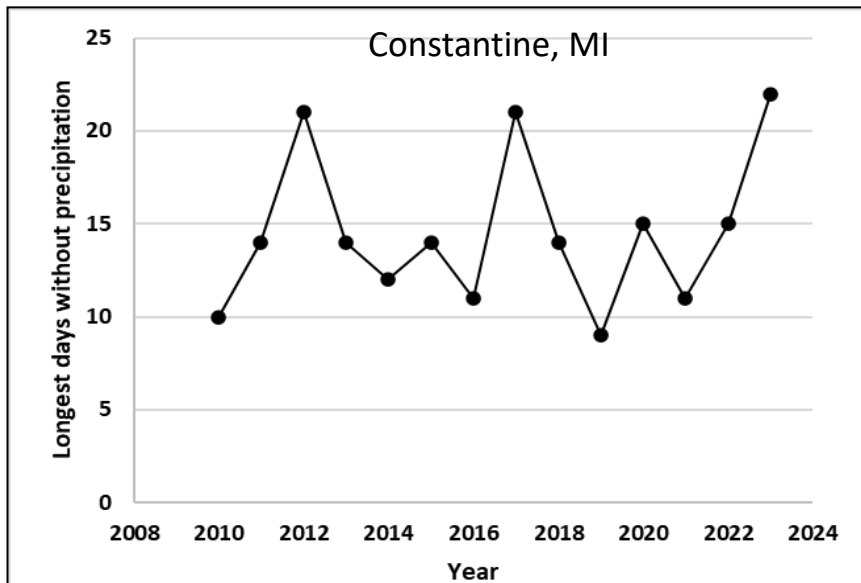
If he is just lost, you can return him to the farm in Burr Oak, MI.





- Maximize yield and quality
- Maximize efficiency of in-puts
- More efficiently use water

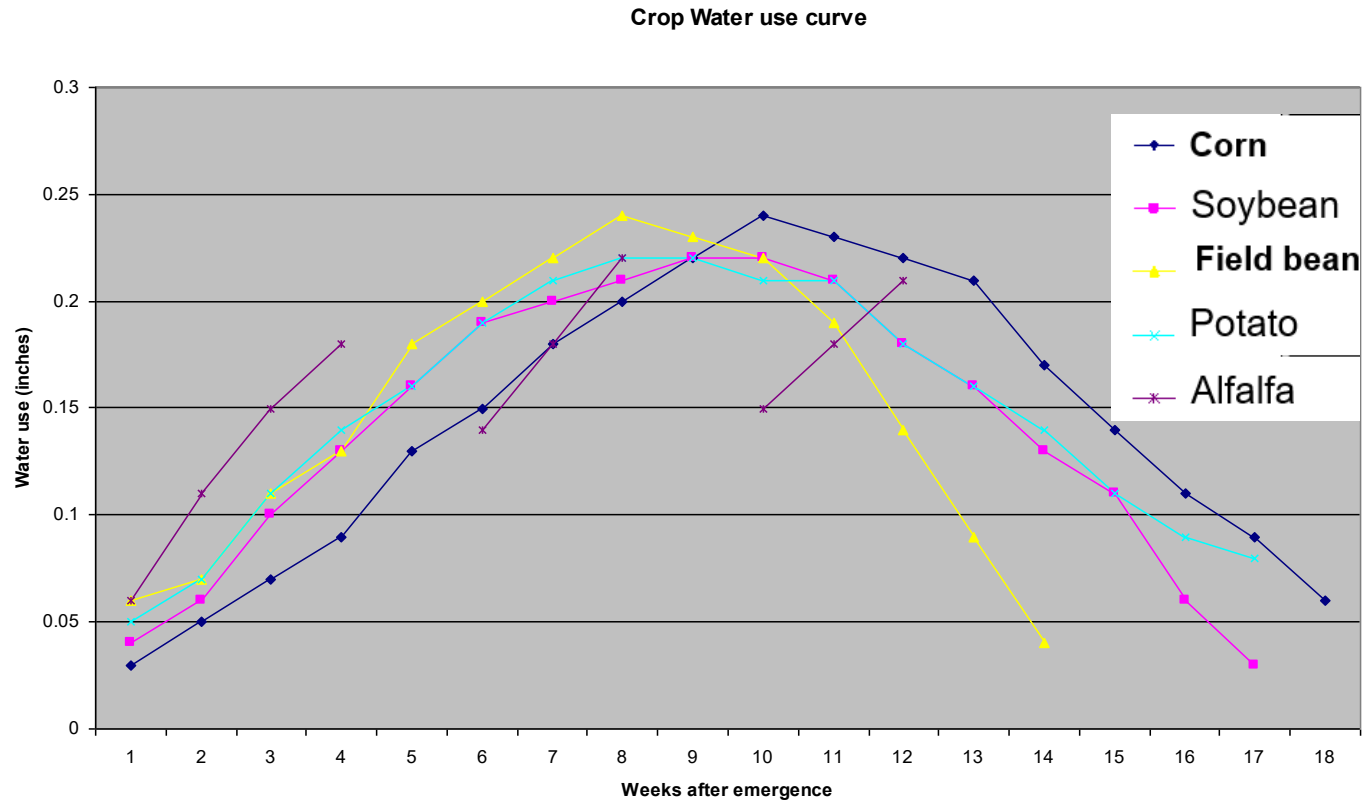
Impacts of Climate Change on Water Management in Agriculture



**Longest period without precipitation during the growing season (May - September).
Most seasons require irrigation to prevent yield loss.**

Do you have enough capacity?

Maximum water use: Mid-July - early August, full light interception, highest temperatures and brightest days.



5 gal/minute/acre pump capacity to meet common field crop water use. (7 days/week, 24 hrs./day)

- Maximum water use for most crops is 0.27 - 0.32 in./day
- 3 gal/minute/acre pump capacity = 1"/week
- 5 gal/minute/acre pump capacity = 0.25"/day
- 7 gal/minute/acre pump capacity = 0.33"/day, 1" every 3 days
- 500 gal/minute pump can provide 1" every 4 days on 100 acres

Featherstone Rd

Featherstone Rd

Feathe

Bills Farm-Added
41 acres irrigated
One 4 tower pivot
One 2 tower pivot.
5 GPM/acre

Studeman Farm
101 acres irrigated
¾ turn 7 tower pivot
6.5 GPM/acre

Total 160 acre under 5 pivots
+ 6 stationary big gun
+ 1.0" every 5 days or 0.20"
of Et.
About 4 gpm/acre



Electrical disconnect x

Big gun stand, BG. Stand pipe * well

Available Water Holding Capacity

Soil Type / depth	Bronson	Capac	Oshtemo	Spinks
0" to 6" 0" to 6"	.84" .84"	1.2" 1.2"	.75" .75"	.54" .54"
6" to 12" 0" to 12"	.86" 1.70"	1.2" 2.4"	.75" 1.50"	.54" 1.08"
12" to 18" 0" to 18"	.90" 2.60"	.99" 3.39"	.87" 2.37"	.54" 1.62"
18" to 24" 0" to 24"	.90" 3.50"	.99" 4.38"	.93" 3.30"	.54" 2.16"
24" to 30" 0" to 30"	.58" 4.08"	.99" 5.37"	.93" 4.23"	.42" 2.58"
30" to 36" 0" to 36"	.34" 4.42"	.93" 6.30"	.86" 5.09"	.36" 2.94"

Calculating drought capacity

- Crop ET. was 0.30 in./day
- Available water capacity of **03.0 in.** (AWC)
- Irrigation system can apply 0.20 in./day.
- Started irrigating when the AWC was **1.0 in.** down
- **3.0 in.** (AWC) - **1.0 in.** = 2.0 in. available capacity
- 2.0 in. available capacity/0.10 daily deficit = 20 days
- 20 days of drought capacity- Not Considering down time





Limited Water Supply Irrigation Management

- Diversify the crops sharing the water supply between high and low water use.
- Stagger planting dates to stagger peak water need times.
- Plant part of irrigated area to a sacrifice crop to neglect during extended drought.
- Start irrigating early to bank water ahead.
- Stagger forage crop cutting dates to avoid simultaneous peak use.

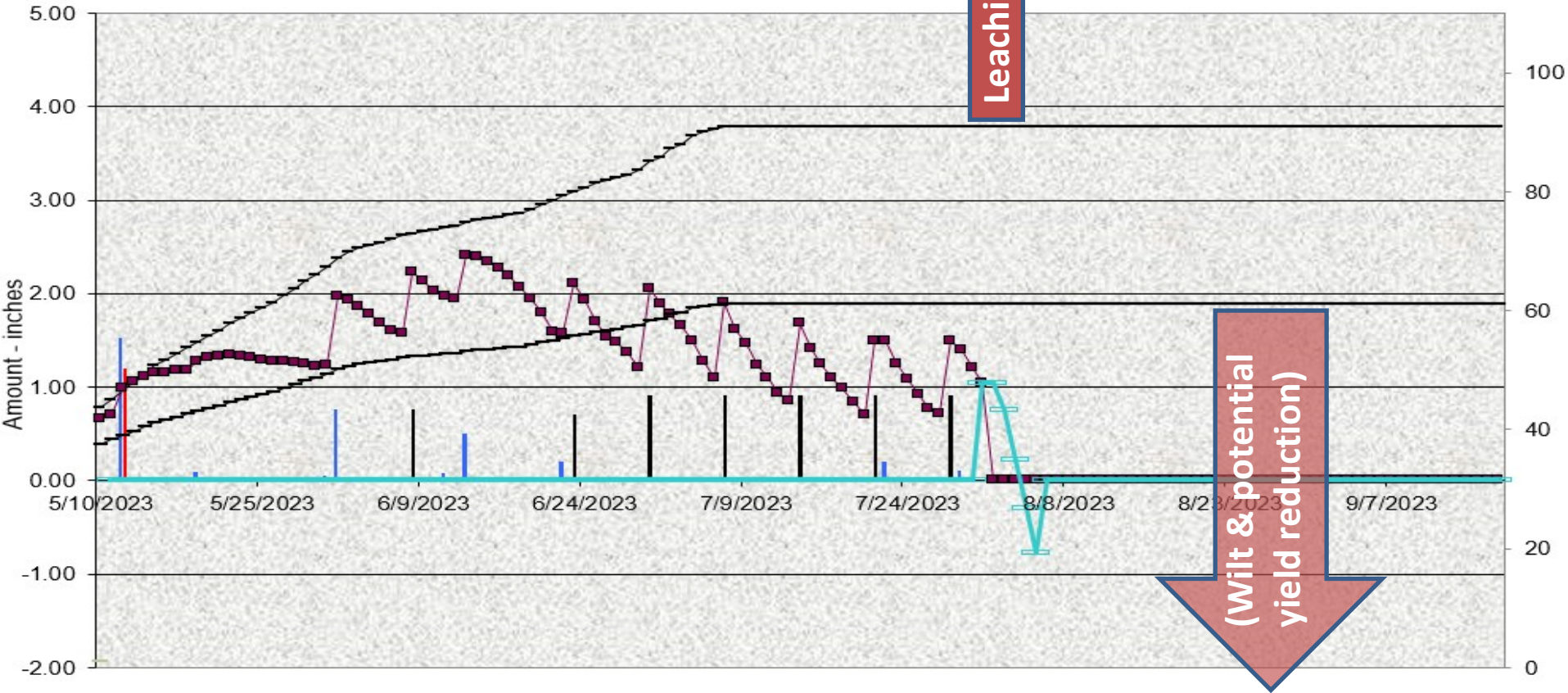
Home S

Station: Berrien Springs

Available Plant Water

Corn36

Soil Series: Sandy Loam /
MSU Irrigation Schedule Coarse Loam



3.47007874 5.95 1.2

Rainfall (inches) Irrigation added (inches) Drainage (inches) Capacity in Root Zone
AW in Root Zone % capacity Projected AW Target Soil Moisture



Plant water stress symptoms - too late to avoid yield loss



Commercial Corn Irrigation Project Updates

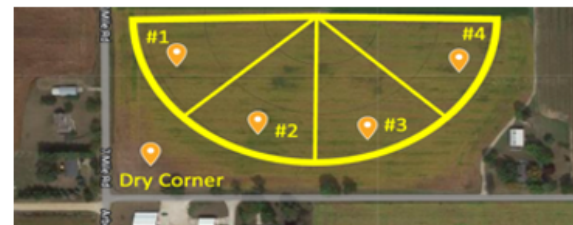
Irrigation Treatment

Treatment #1: Producer's Irrigation Management (Irrigation schedule + personal schedule)

Treatment #2: 100% Irrigation Management (Soil moisture sensor-based)

Treatment #3: 130% Irrigation Management

Treatment #4: 70% Irrigation Management



Irrigation Treatment	Yield (bu/acre)	Irrigation Water Use Efficiency (bu/acre-inch)	Value* (\$/acre-inch)
Treatment #1	305	19.5	132
Treatment #2	319	22.4	152
Treatment #3	319	19.3	131
Treatment #4	309	20.3	137
Dry Corner	218		

*Assumed that corn price is \$6.77/Bushel (1/20/23)

The 100% Irrigation Management (4.5") (Soil moisture sensor-based) yielded the same as the 130% Irrigation Management (5.25") with 0.75" less water and expense.

A 10 bu. reduction in yield and \$64 in net income resulted from a 0.75" reduction in irrigation water.

Riparian Doctrine

- From ancient **public trust doctrine**
- Tidelands held by the king for the benefit of all English subjects
- Must be a **beneficial use** to individual and public
- Navigable lakes and streams held in trust for benefit of the people of the state
- Riparian rights subservient to state's public trust authority

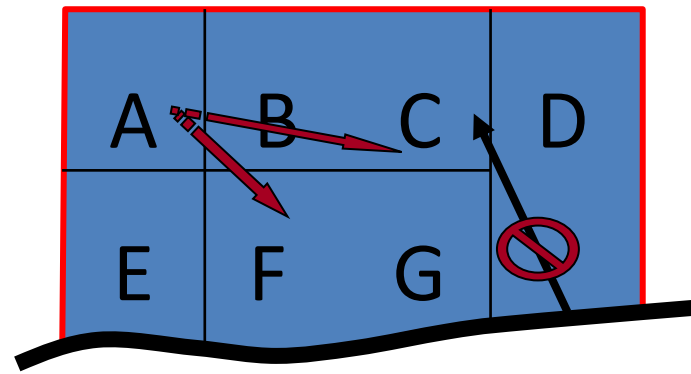


A riparian may **not**...

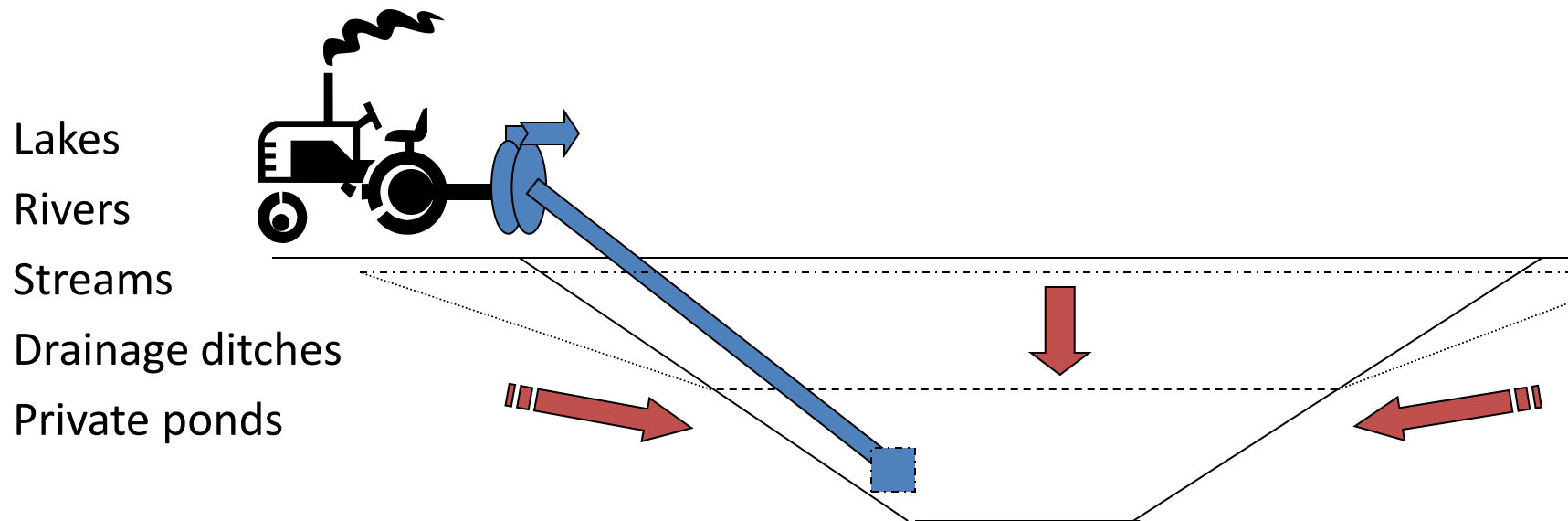
- Sell or give away those rights
 - Example: drawing water to irrigate non-riparian lots
 - Ground water rights are not the same....
- Diminish rights of other riparian owners
 - Example: excessively lowering lake level through irrigation

Surface Water Sources

Riparian Doctrine, Severance Rule



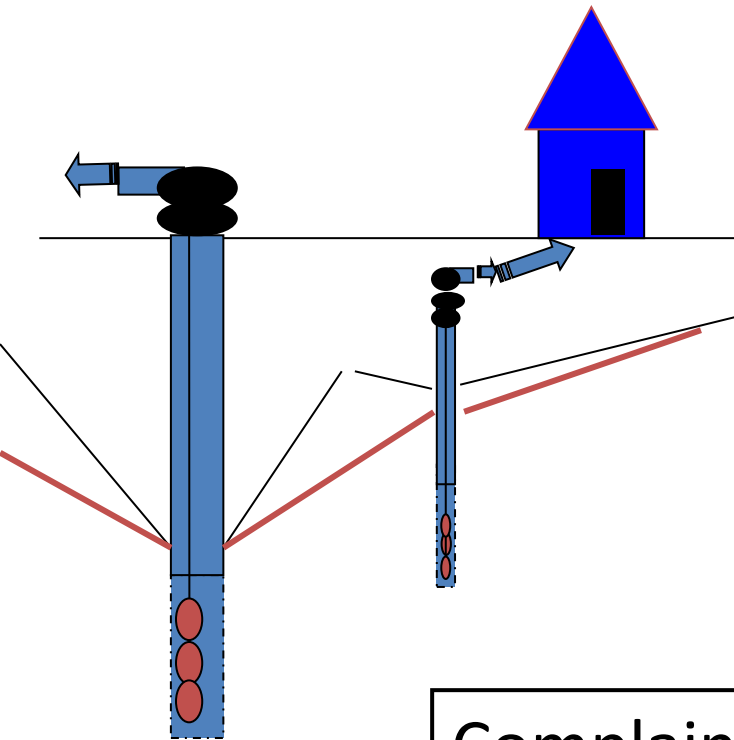
- If challenged, water rights may be restricted to Riparian parcels.
- Once a parcel has been subdivided, the parcels no longer retaining waters edge lose their Riparian Rights.
- Once rights are lost they may not be regained (reattachment of subdivided parcels does not re-establish water rights).
- Commonly violated, but one of the easiest ways to get injunction against a neighbor.



Large capacity water users have a legal responsibility for neighboring wells

(Michigan Part 317 - Aquifer Protection and Dispute Resolution)

Where neighboring wells were negatively impacted courts have forced large capacity water users to improve or replace the affected well to regain its function.



Complaints: 855-629-4337

Indiana Water Rights & Use - Regulations and Requirements

<http://www.in.gov/dnr/water/2451.htm>



- Water Resource Management Act - Indiana Code 14-25-7; Significant Water Withdrawal Facility (SWWF) Registration and Water Use Reporting; >70 gpm Capacity
- Water Rights: Emergency Regulation Statute- Indiana Code 14-25-4; Ground Water Use Conflict
- Surface Water Rights Statute - IC 14-25-5; Protects Lake Level From SWWF Pumping
- Volunteer Water Monitoring Program - HEA 1319 (2015); Expands Indiana's GW and SW Monitoring Network, USGS approved protocol, data available through IDNR on-line monitoring website.

Contact IDNR, Division of Water at:

Mark Basch at (317) 232-0154 or mbasch@dnr.in.gov
Allison Mann at (317) 234-1101 or almann@dnr.in.gov

Large volume/ Significant Water Use Requirements

- Require **permits** for new uses over 2 million gallons per day.
- Sets a performance standard for large scale water users (> 70 gallon/minute) and reporting.
“no adverse resource impact”
- Where agriculture fits:
 - > 100,000 gal. a day < 2 million gal. per day.
 - Need to register and report, no permit required.

ENTER WITHDRAWAL INFORMATION

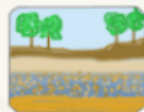
Pumping Source and Frequency

* Fields indicated with an asterisk are required.

* Withdrawal Source:
(select an icon)



Surface Water
(from stream)



Groundwater



Shallow Pond

Pumping Parameters

* Pumping Capacity
(GPM):

500

Lat/Long from Map:

42.877284,
-85.071467

* Well Casing Depth
(ft):

140

* Aquifer Type:

Bedrock Glacial

Stats at Location

- Depth to Bedrock (FT): 214
- Average Well Depth (FT): 105
- Percent Wells in Glacial: 65
- Percent Wells in Bedrock: 34

Pumping Schedule

Continuous Pumping

* Months
Pumping:

Jun
Jul
Au
Se
Oct

* Pumping Hours/Day:

24

* Pumping

Days/Week:

7

(hold Ctrl to select multiple months)

Run Model

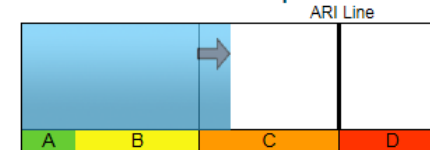
Run the Tool

To evaluate a proposed withdrawal, first locate where the withdrawal will be placed on the map. Next click the "New Withdrawal" button below. Then click on the map where the withdrawal will be located.

New Withdrawal

Water withdrawal screening results

ARI Zone Graph



The graph above illustrates the estimated impact of the proposed withdrawal on the affected stream, and its potential for causing an adverse resource impact (ARI).

Result: Zone C
The proposed withdrawal has failed the screening process.

You must request a site specific review below in order to begin using this withdrawal.

Results:

The proposed withdrawal has failed the screening process. The projected impact of the withdrawal lies within 'Zone C' and is likely to cause an adverse resource impact.

Registration:

A large quantity withdrawal (LQW) with a capacity of 70 or more GPM must be registered before the withdrawal can begin. To register this withdrawal as you just entered it, use the button at the right.

A registration must be verified within 18 months by installation of the withdrawal. A registration that does not match actual installation, or that has not been installed within 18 months becomes void.

Stream Classification: Cool stream

[Learn more.](#)

Site-Specific Review

Rerun

Administrator

View Report

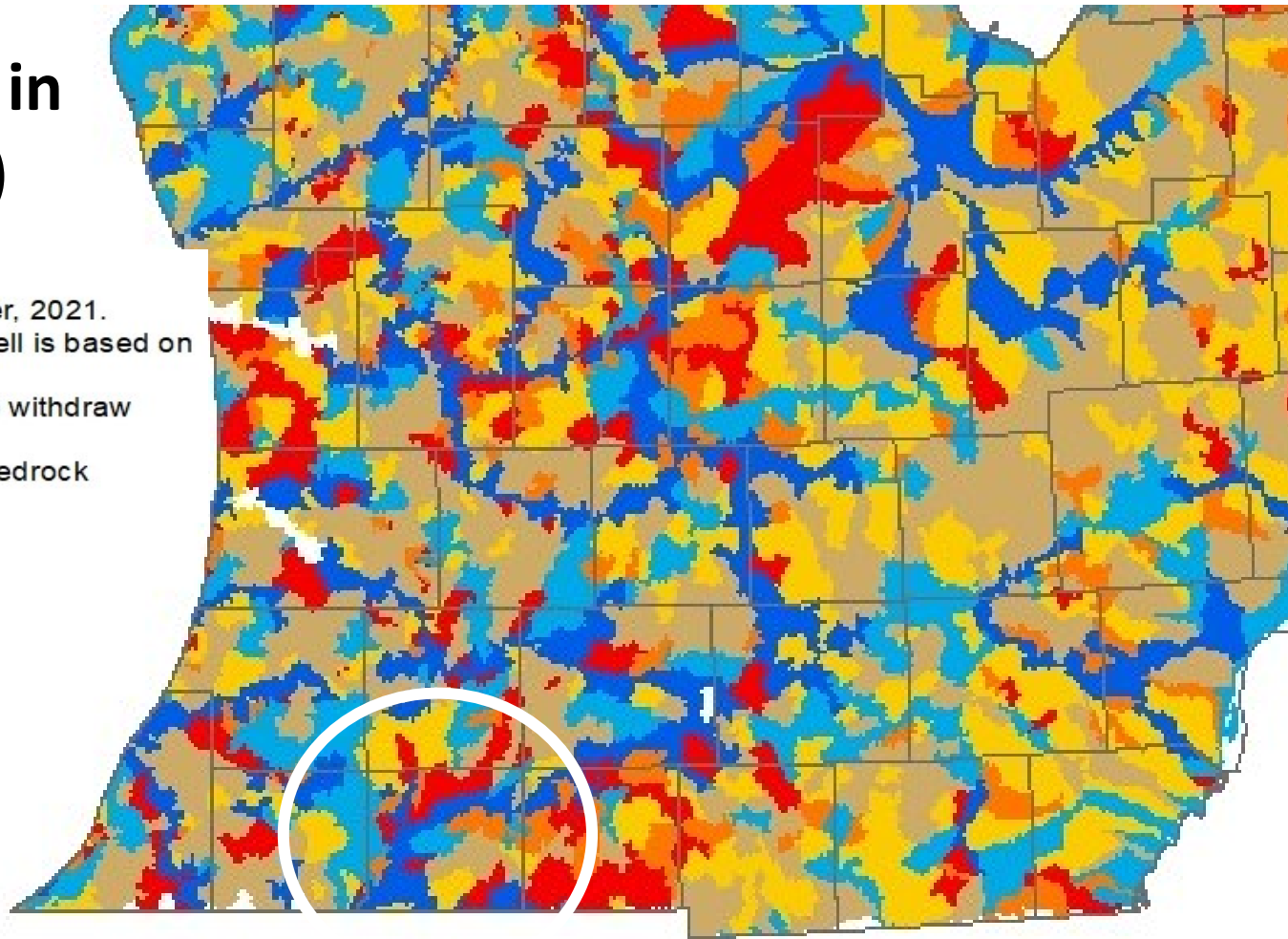
Michigan Water Withdrawal Assessment Tool (MIWWAT)

<https://www.deq.state.mi.us/wwat/map.aspx>

Available Water in MIWWAT (GPM)

Notes:

Based on data available November, 2021.
Impact of water withdraw from a well is based on the distance from the well.
A groundwater withdrawal can also withdraw water from adjacent watershed.
Does not include available in the bedrock not connected to the stream.



A yellow designated area may only support one or two small withdrawals for a fruit or vegetable operation or a single 100 acres field with a well in the right location.



A tan designated area may only support one more direct withdrawal from the stream to support 100 to 140 acres or 300 to 400 groundwater irrigated acres depending on positioning.

Increasing Pump Capacity

It's more than a bigger pump issue

Wells

- Well screen and formation maybe limiting.
- Your well driller or maintenance company can often tell from the well driller log and pump test if there is additional capacity in your existing well setup.

Ponds

- Recharge capacity far more important than volume.
- Volume indicates storage capacity allowing for pumping rate higher than recharge rate. Test pump at higher pumping rate during late/dry season.

Re-nozzling center pivots

- In many situations the sprinkler can be redesigned for a lower pressure allowing greater volumes from the equipment or with minimal investment.

