Hazelnut Irrigation 101

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Ontario Ministry of Agriculture, Food and Rural Affairs

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1. Advantages
2. How much water do you need?
3. Irrigation systems
4. Developing a water supply

Advantages

- Good establishment
- Helps bring trees to production faster

Increases:

- Vegetative growth
- Nut weights
- Nut yields
- Nut size

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- Nut yields
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- Reduces number of blanks
- Spring irrigation can positively affect nut production in the following year

This picture shows a filbert and pecan orchard in September 1990, the year of its planting.

Here is the same orchard 34 months later, having benefitted from a trickle irrigation system.

French Research 1980s

- Although its water requirement is not high, this species is very sensitive to drought stress (Mingeau et al 1994)
- Ennis and Fertile de Coutard
- Kc=0.8

Nebraska study 2003

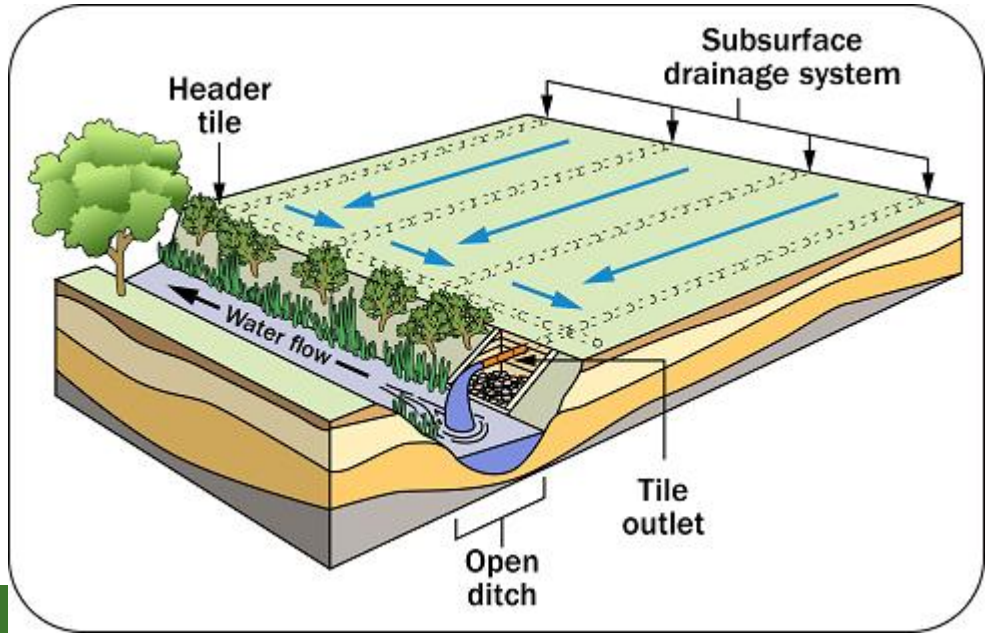
- Nut production was not affected by water treatment (Awada and Josiah 2004)
- All trees watered in establishment year and as needed in year 2
- Treatment started in year 3, no difference in soil moisture in May-June because of sufficient rainfall.
- American Hybrids 88BS, G17, GEL502, BOX1. 176.8 g/plant to 30.3 g/plant (nut clean weight)

- Some crops can survive with low water, but that doesn’t mean they will be productive in dry conditions

- Hazelnut trees are medium-rooted with the majority of the root system in 0.5 -1m of soil if the field has adequate drainage

Drainage

- Tile drainage should be installed between every row or every other row
- On some very deep sandy soils, tile drainage is not necessary
- Drain depths should be 750mm or deeper (max 1,200mm)



BMPs for Hazelnut Irrigation

- Hazelnut trees should be irrigated every year during periods of low rainfall.
- Irrigation is most important in establishment to promote adequate root development.
- Sufficient water must be used to wet the entire rooting zone.

Critical Hazelnut Irrigation Periods

- 6 weeks post-bloom (can affect both current crop as well as flower set for following year)
- Nut fill from mid July to mid Aug

Water Demand

- Mature grove will require 75,600L/ac/week (drip) to 126,000L/ac/week (overhead)
- 40L/tree/day on hottest week of summer

- Typical hot week requires 25mm depth of water across the landscape per week
- 1 acre (approx) = 100,000 L
- Tank for back of a pickup truck 775 L
- Largest airblast spray tank 2,000 L
- Largest water tanker trucks 40,000 L

50 of these sprayer loads for every acre

5 of these tanker 22,000 L trucks for every acre

130 of these tank loads for every acre

- Planting year only 0.8L/tree/ day
- 2 pick-up trucks per week per acre
- 30s/tree = 2.5hrs per acre

2 of these tank loads for every acre

Irrigation Equipment Cost $/acre

Irrigation System	15 acres	50 acres	100 acres
Sprinklers (hand move)	1540	980	-
Travelling Gun	1985	900	700
Drip Tube	3040	2550	2325

Power supply not included

Water Supply

- Existing options on/near farm
- Costs to develop/access
- Water Sources:
  - Stream or Lake
  - Pond
  - Well
  - Pipeline
  - Municipal

Design volumes and flows for irrigation

- Example: 20 acres x 1 inch
- 20 acre-inches
- 543,200 US gal
- 72,600 ft^3

- Example 80’ x 180’ x 13’ with 3:1 sideslopes

Design volumes and flows for irrigation

- Example: 20 acres x 1 inch x 6 events
- 120 acre-inches
- 3,260,000 US gal
- 435,600 ft^3

- Example 145’ x 300’ x 23’ with 3:1 sideslopes

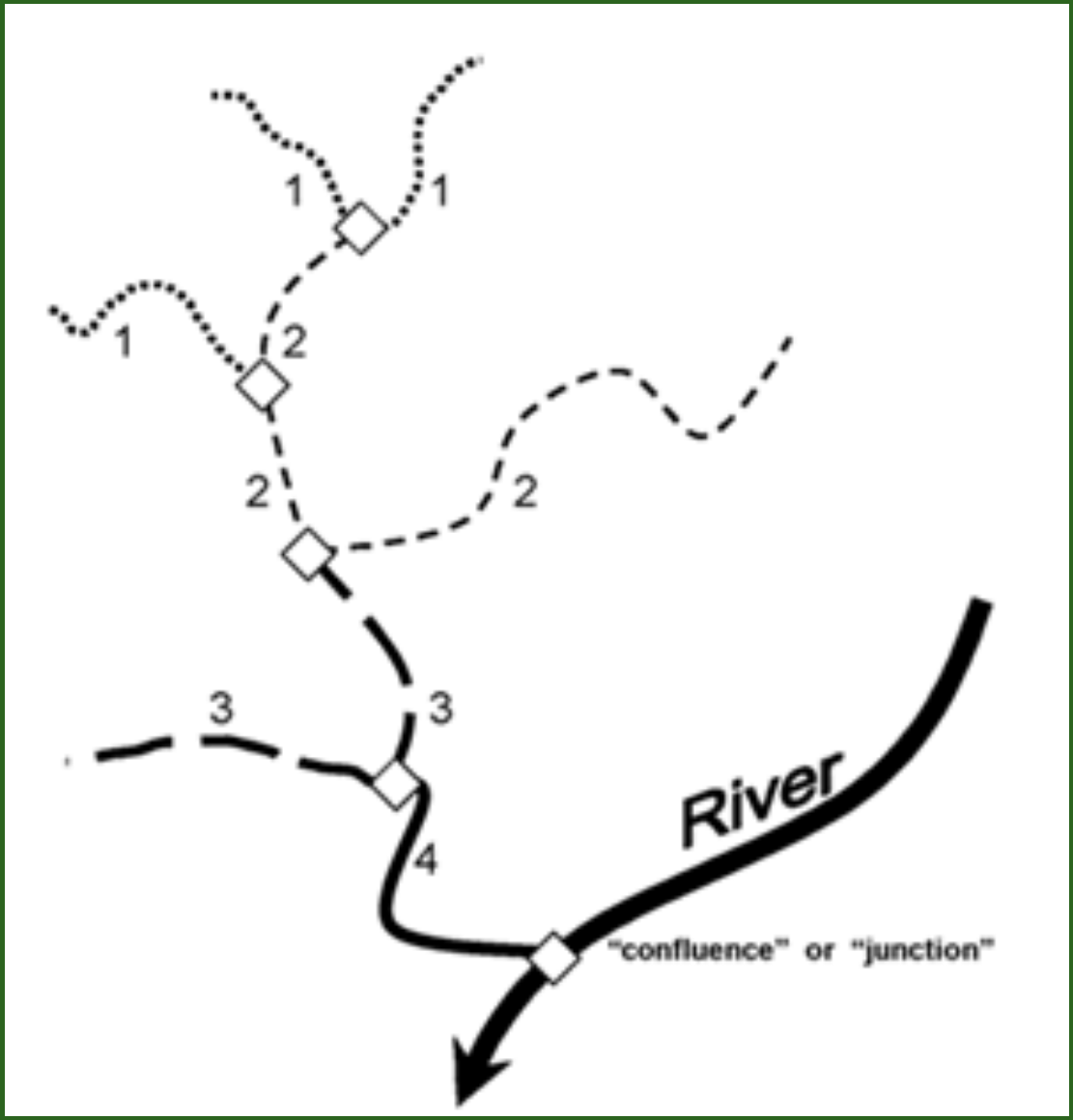
Design volumes and flows for irrigation

- Design, Construction and Maintenance of Irrigation Reservoirs in Ontario
- http://www.omafra.gov.on.ca/english/engineer/facts/16-009.htm

Design volumes and flows for irrigation

- Rule of thumb 5 US gpm/acre (Ontario)

- Example: 80 acres x 1 inch/week
- Big gun at 350 US gpm
- 7 days x 15hr/day


1
1
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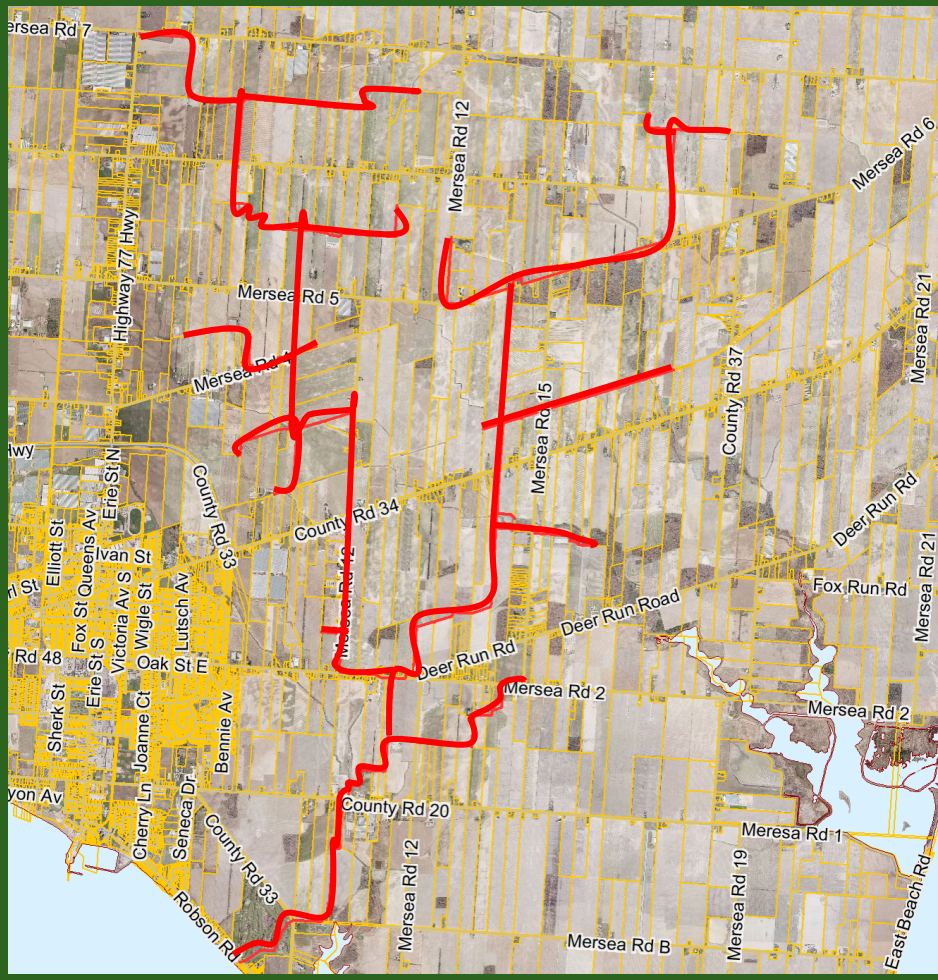
River
"confluence" or "junction"

- LADII pipeline from Lake Erie
- 13 shareholders
- 36km, can irrigate 1,500 acres per growing season
- 2,500 (shareholder) acres accessible by pipeline
- $10M



Municipal Supply

- Industrial rate?
- Off peak usage?

Permit To Take Water (PTTW)

- Ontario Water Resources Act (OWRA 1963)
- Required for takings >50,000 L on any one day
- 1” applied to ½ acre

Permit To Take Water (PTTW)

- Required for all sources, including those constructed by land owner
  - Pond, lake, reservoir
  - Stream, ditch, river
  - Well, sand point
- Typically Permits are issued for 5 or 10 years

Why is a Permit required?

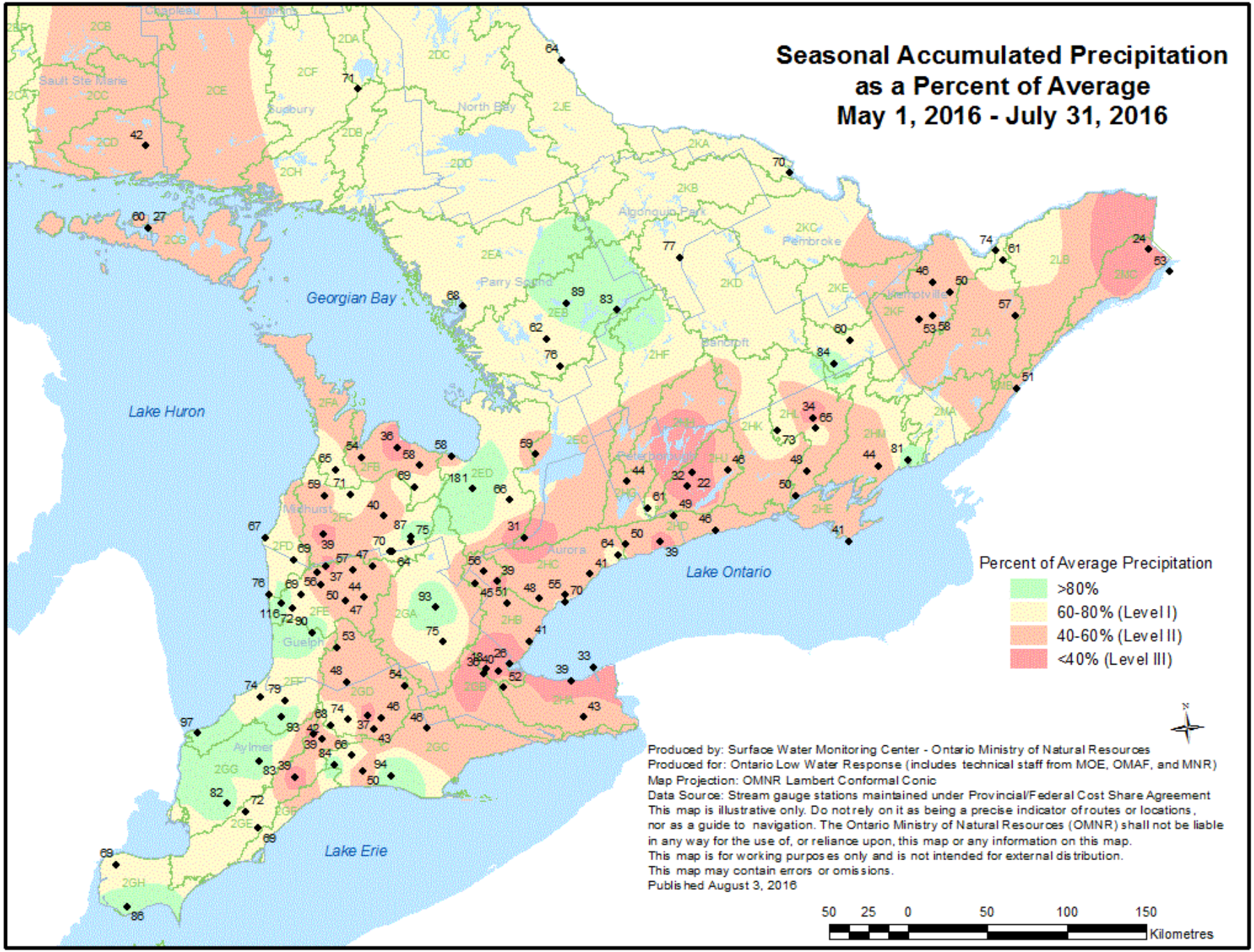
- To protect prior water users (wells, ponds, streams, existing permits, ecosystem)
- To protect the watershed (sustainable water supplies)
- Documents your use of water
  - Protects your source from significant interference by new users

Permit To Take Water (PTTW)

- No fee to MECP for irrigation of crops for sale
- No per volume charge for irrigation of crops for sale
- Significant costs to demonstrate that your taking won't impact other users or the natural environment (Impact Study)
  - Generally not required for renewals
- Requirement to report daily takings at the end of each year

Permit To Take Water

- Call MECP and ask for a pre-submission consultation before investing any $$
- Anticipate 3 months for processing of PTTW application


Seasonal Accumulated Precipitation
as a Percent of Average
May 1, 2016 - July 31, 2016
Georgian Bay
Lake Huron
Lake Ontario
Lake Erie
Percent of Average Precipitation
>80%
60-80% (Level I)
40-60% (Level II)
<40% (Level III)
Produced by: Surface Water Monitoring Center - Ontario Ministry of Natural Resources
Produced for: Ontario Low Water Response (includes technical staff from MOE, OMAF, and MNR)
Map Projection: OMNR Lambert Conformal Conic
Data Source: Stream gauge stations maintained under Provincial/Federal Cost Share Agreement
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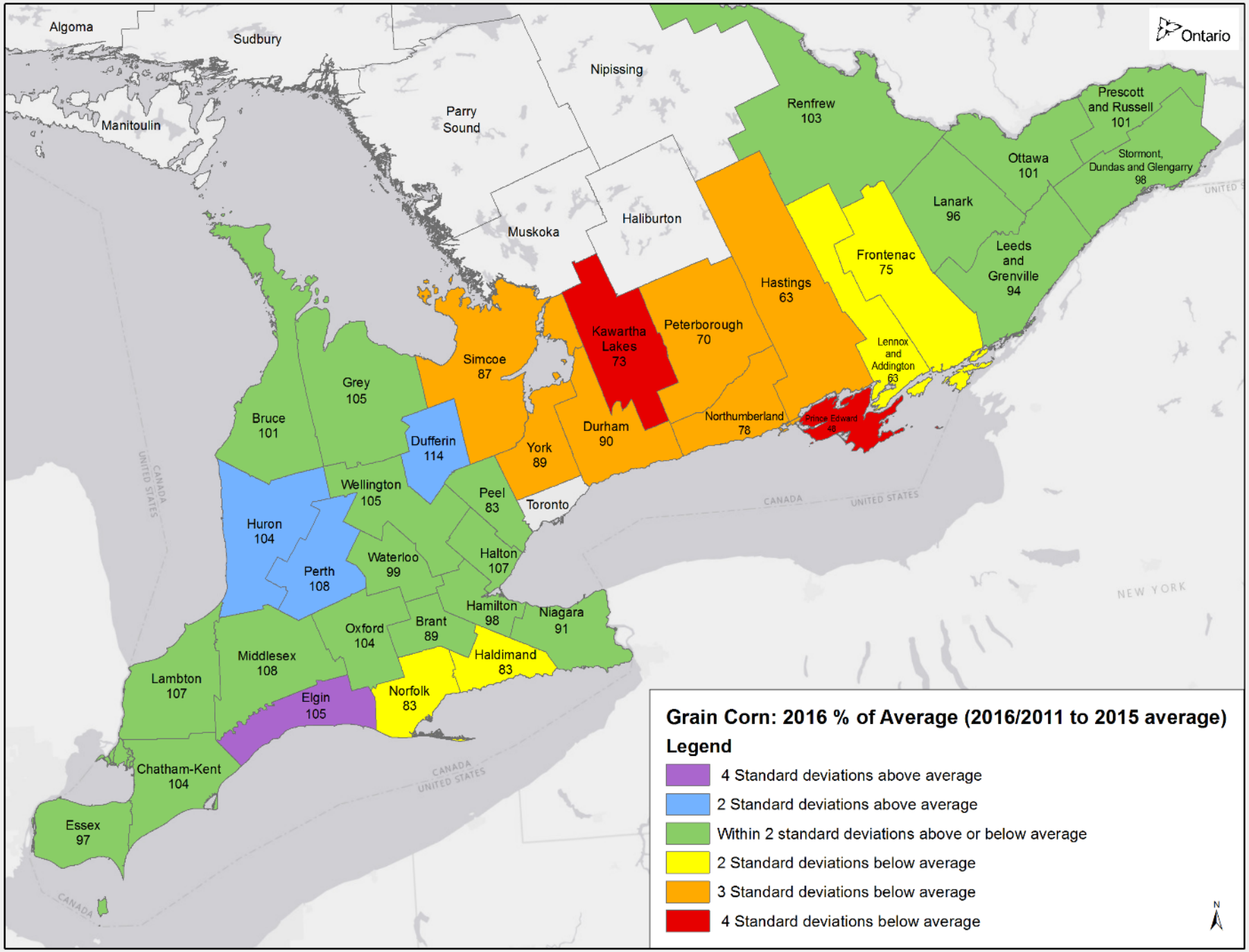
Kilometres


Ontario
Algoma
Sudbury
Nipissing
Manitoulin
Parry Sound
Muskoka
Haliburton
Renfrew 103
Prescott and Russell 101
Ottawa 101
Stormont, Dundas and Glengarry 98
Lanark 96
Leeds and Grenville 94
Frontenac 75
Hastings 63
Peterborough 70
Kawartha Lakes 73
Simcoe 87
Grey 105
Bruce 101
Dufferin 114
Lennox and Addington 63
Prince Edward 46
Northumberland 78
Durham 90
York 89
Toronto
Peel 83
Wellington 105
Huron 104
Perth 108
Waterloo 99
Halton 107
Hamilton 98
Niagara 91
Oxford 104
Brant 89
Haldimand 83
Middlesex 108
Lambton 107
Elgin 105
Norfolk 83
Chatham-Kent 104
Essex 97
CANADA
UNITED STATES
NEW YORK
Grain Corn: 2016 % of Average (2016/2011 to 2015 average)
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4 Standard deviations above average
2 Standard deviations above average
Within 2 standard deviations above or below average
2 Standard deviations below average
3 Standard deviations below average
4 Standard deviations below average
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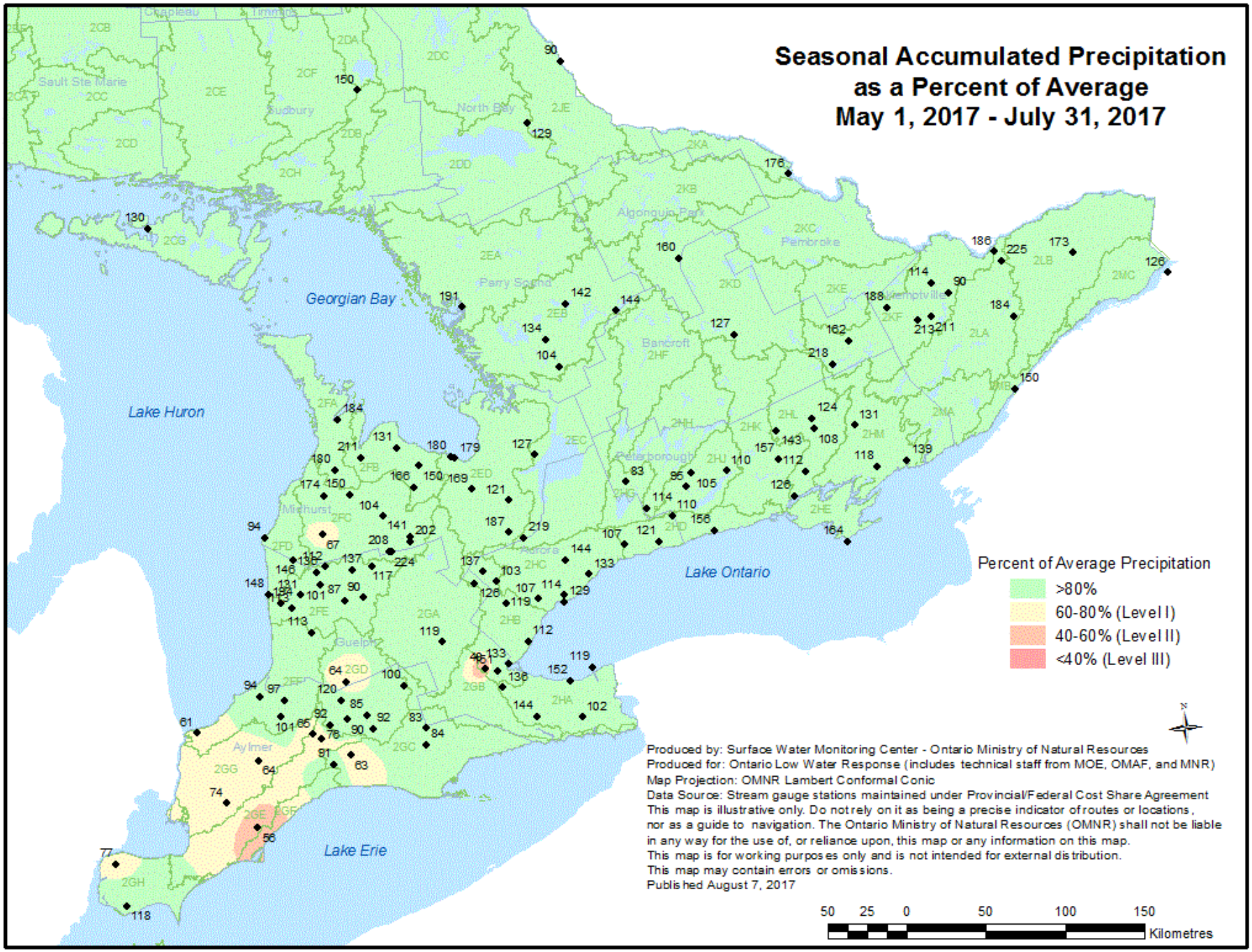
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Summary

- Understand cost/benefit and how that changes with increased drought frequency
- http://www.omafra.gov.on.ca/english/engineer/irrigation.htm
- Google “Irrigation OMAFRA”

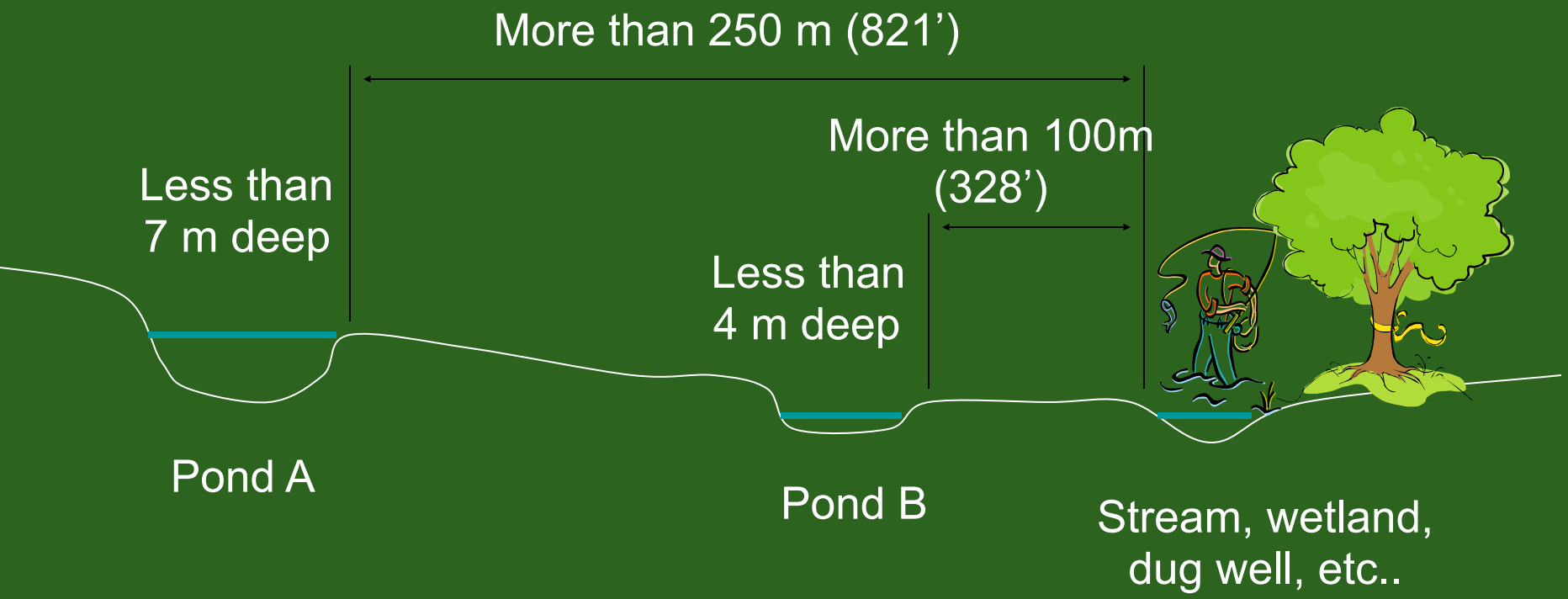
APPENDIX 1

Category 1 = no impact study required

- Renewal, same or lesser amount
- Great Lakes or connecting channels <1,000,000L/day (9.7 acre-inches)
- Ground water fed pond
  - <13 ft deep and >328 ft from sensitive features
  - <23 ft deep and >821 ft from sensitive features
- Runoff pond <1500 m3 (15 acre-inches)

Category 1

Ponds: No connection to surface water, Not receiving surface water



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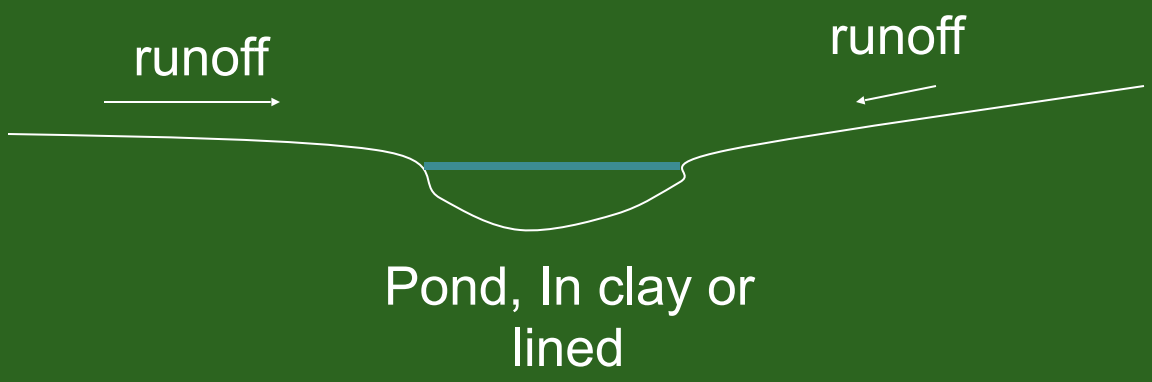


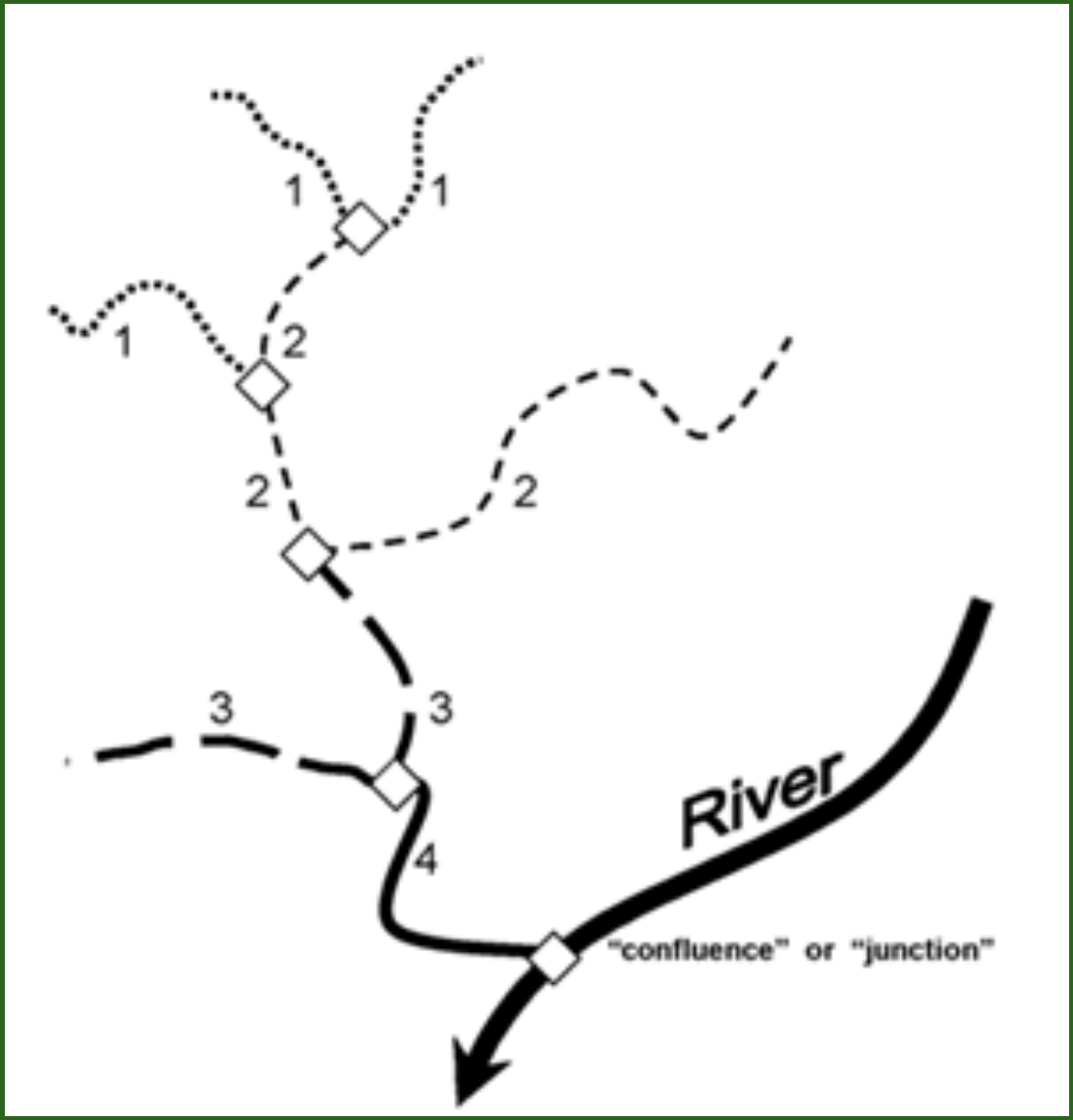
Pond size less than 1500 cubic meters (1,500,000 litres)

1,500,000 litres = 1 inch of water applied over 14.6 acres

Problem: after 14.6 acres irrigated the pond is dry until there is more run off

Category 2 = Requires Evaluation

- Great Lakes or connecting channels <19,000,000L/day (185 acre-inches)
- Rivers and streams (3rd order or higher) taking less than 5% of 7Q20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River
"confluence" or "junction"

Category 3 = Requires Scientific Study

- all other situations including all wells
- Requires scientific study by a qualified professional to show that water taking has limited impact on other water takers or the natural environment