Pits & Quarries in Ontario

Module 1

Water Management Basics

Numerous myths exist about pits & quarries

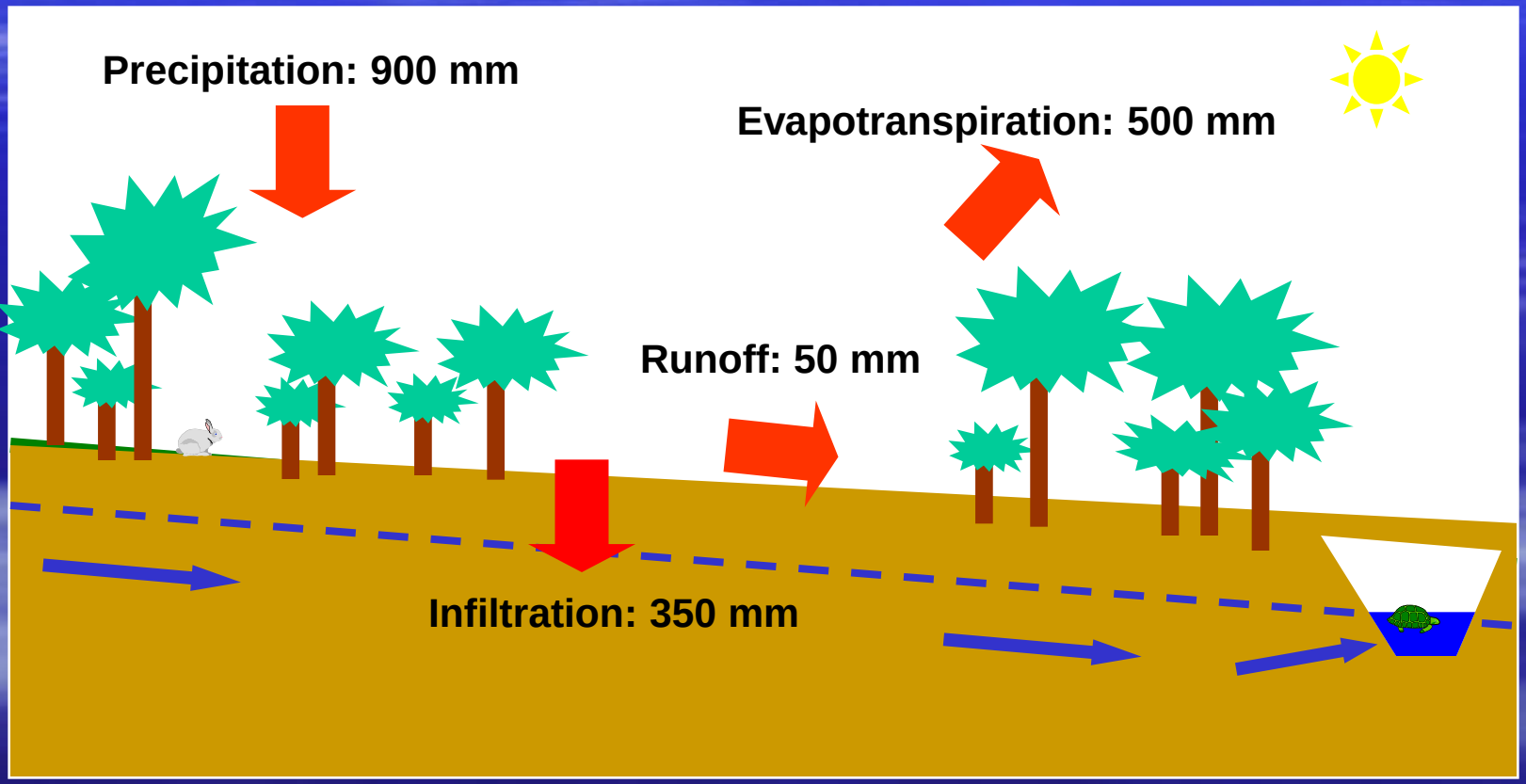
How Pits & Quarries Function

- Water management varies according to the type of operation

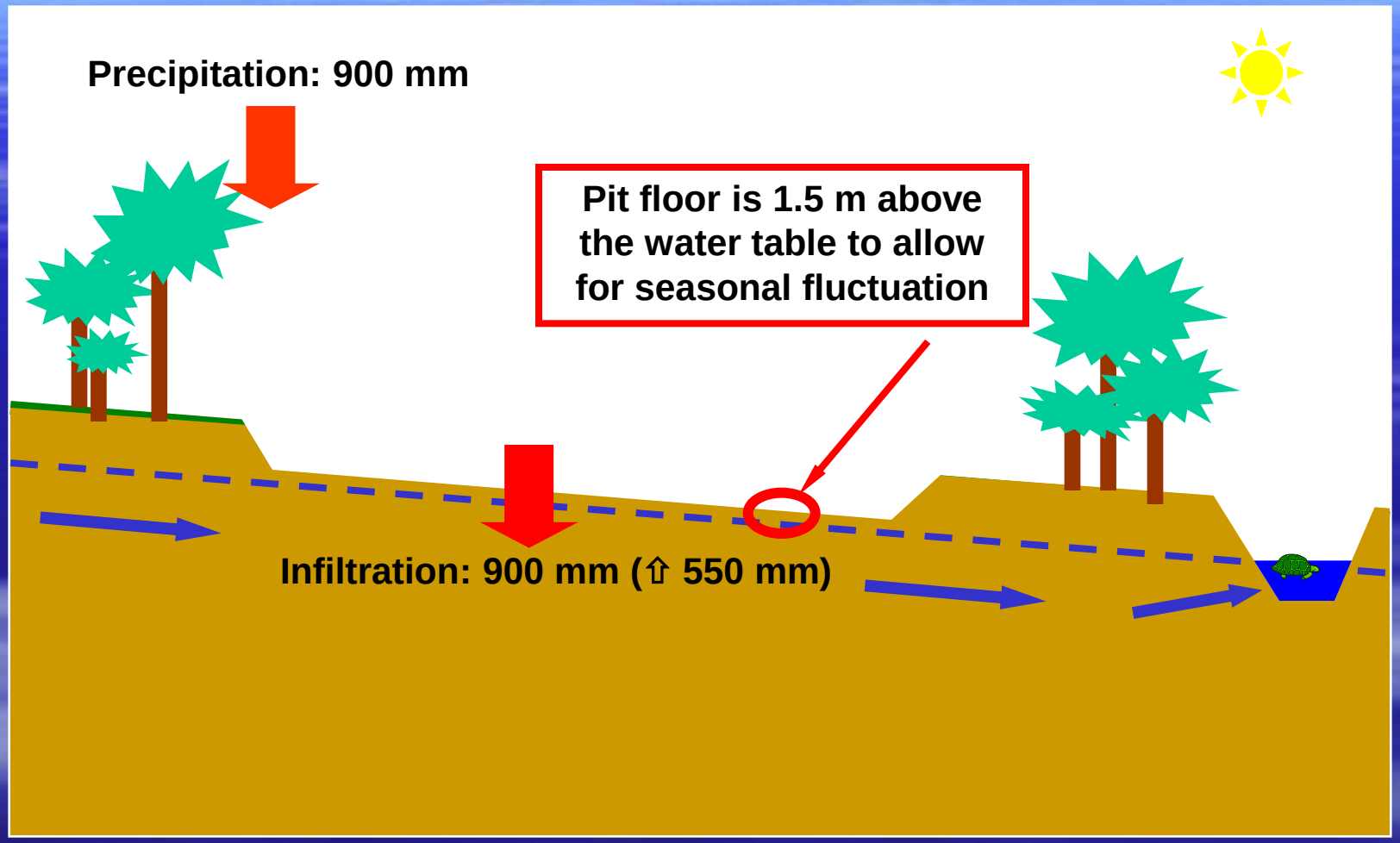
Above-Water Pits

- Above-water pits do not impair water resources
- In fact, they can increase groundwater recharge

Typical Water Balance



Above-Water Pits: Water Balance



Above-Water Pits: Water Balance

Result of aggregate extraction

- Increased aquifer recharge and stream baseflow

Fonthill Pit, Lafarge Canada Inc.

- More than 20 m above the water table
- Over 20 years of groundwater monitoring
- No change detected in the water table

Below-Water Pits

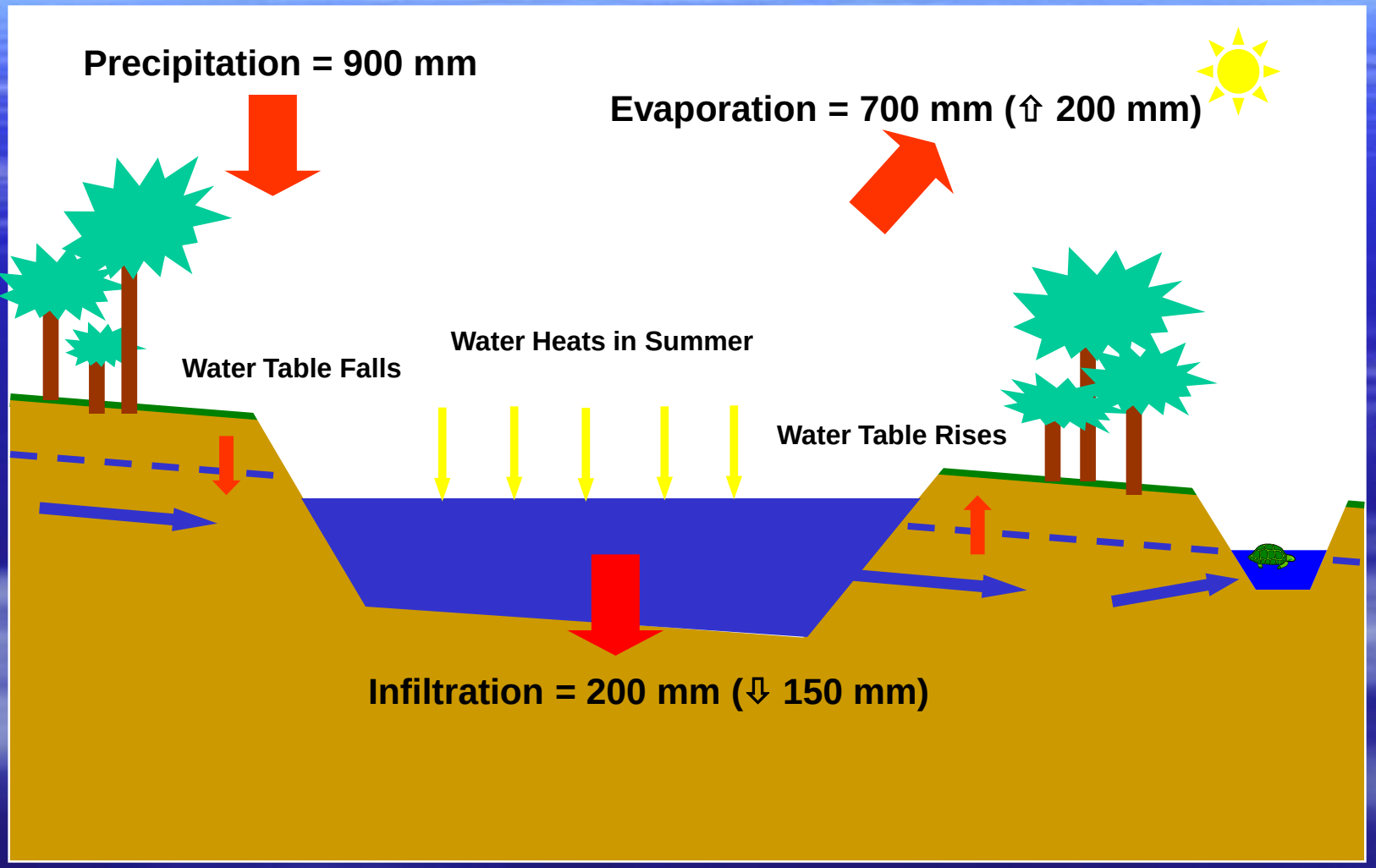
- Dredging sand & gravel can have localized effects on the water table – sensitive features, such as shallow wells, wetlands and streams need to be identified and protected

Below-Water Pits: Implications

Potential impacts include:

- Drawdown due to dredging
- Evaporation from the pond
- Levelling of the water table
- Increased aquifer storage
- Water temperature increase

Below-Water Pits: Water Balance



Below-Water Pits: Water Balance

Results of extraction

- Water table adjustments can affect shallow wells and sensitive vegetation
- Stream baseflow can be warmer

Below-Water Pits: Dredging

- Dredging creates a temporary drawdown effect - imagine taking a handful of sand out of a bucket of sand & water
- Groundwater flows into the pit to offset extraction, resulting in lower water table levels

Below-Water Pits: Dredging

Example

- Daily Production Rate 1,800 tpd
- Solids @ 30% porosity x 70 %
- Density ÷ 1.8 t/m^3
- Equivalent water withdrawal 700 m^3/day

(Equivalent to 700,000 Lpd or 8 L/s or 107 Igpm)

Below-Water Pits: Evaporation

Evaporation can be significant

Example

- Pond area (100-acre pit) 25 ha
- Daily evaporation (hot, dry, windy) x 13 mm
- Water loss 3,250 m^3/day

(Equivalent to 3,2500,000 Lpd or 38 L/s or 496 lgpm)

Below-Water Pits: Levelling

- A sloping water table will level out in a pond

Solution

- Dig several smaller ponds to “step” down the water table

Below-Water Pits: Storage

- Pit ponds create a “reservoir”
- Increases storage by 70%
- Regulates and extends stream baseflow during drought
- Example: Mill Creek

Below-Water Pits: Temperature

Can warm water from a pit pond discharge to cold water fisheries streams?

- Modelling and field studies show that temperature effects dissipate within a few hundred metres or less
- Setbacks from cold water streams can be established to prevent effects

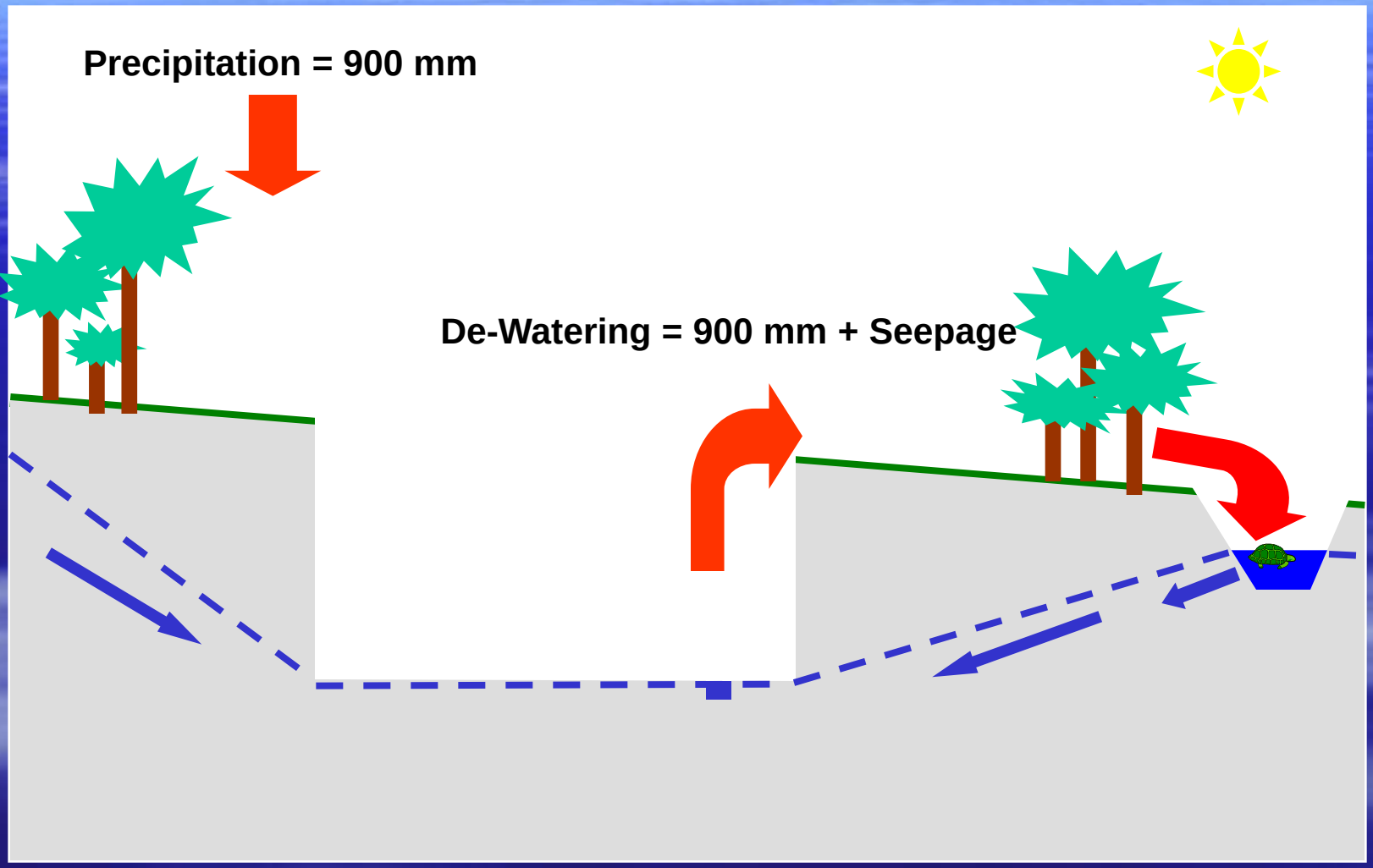
Below-Water Pits: Summary

- Below-water aggregate dredging leaves the water in the pit
- Any effects on the adjacent water table tend to be relatively small and in close proximity to the pit

Below-Water Quarries

- Quarries have to be de-watered in order for extraction to occur
- This must be carefully designed and managed to minimize the impacts on surrounding water resources

Below-Water Quarry: Water Balance



Below-Water Quarry: Water Balance

Results

- Drawdown cone can affect wells and sensitive vegetation
- Stream may lose baseflow but gain dewatering discharge

Below-Water Quarries: Dewatering

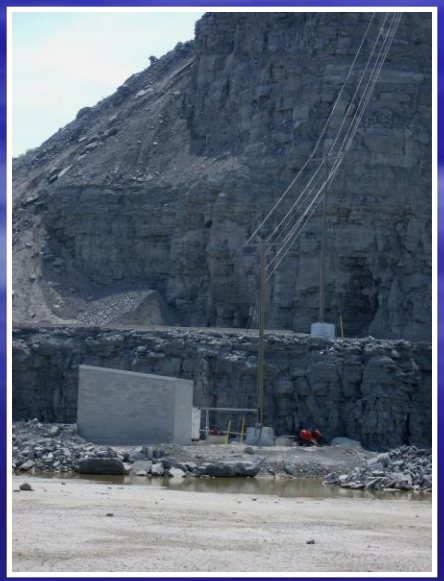
- Excess water resulting from quarry dewatering operations is usually released into nearby streams and/or recharged into the groundwater system
- Virtually all of the water stays in the local watershed(s)

Below-Water Quarries: Blasting

- Blasting does not impact groundwater

St. Marys Cement: Bowmanville Quarry

- De-watered at up to 49 L/s (650 Igpm)
- Permit to Take Water for pumping
- Certificate of Approval for discharge



Other Water Uses

Wash Plants

- Wash water is re-circulated/recycled
- Less than 10% of the water is lost due to evaporation and moisture retention in the aggregate
- “Make-up” water can be taken from a groundwater or surface water source
- Both the wash plant operation and the water taken from the source require Permits to Take Water

Dust Control: Watering/Washing

- Larger operations may require more than 50,000 L/day, and a Permit to Take Water

Contact

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