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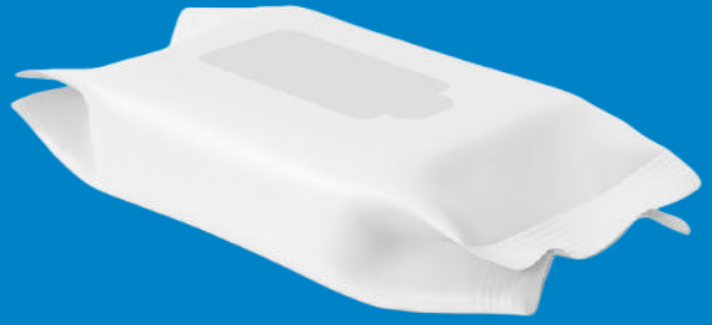
Toilet Paper, Wipes and Low Flow Fixtures:

How they impact Septic Systems

PART 1: Toilet Paper and Wipes

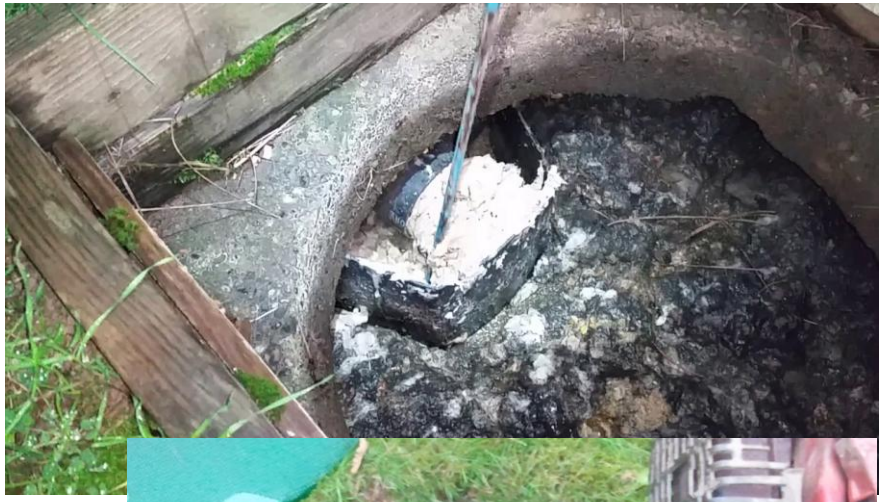


Fun facts and myths about toilet paper…

- 75 % of the world's population does not use toilet paper
- Two-ply paper is often thinner than one-ply paper
- One person uses an average of 57 sheets of toilet paper a day or 100 rolls annually (this is over 20,000 sheets per year)
- It was the first item to experience shortage during COVID
- It takes about 384 trees to produce the amount of toilet paper a person uses in its lifetime.
- A bidet can reduce 80% of toilet paper use and, according to users…provides a better "clean"
- It takes 37 gallons of water to produce 1 roll of toilet paper while a bidet uses in average 1.3 gallons of water per week in a house

What do we expect of toilet paper (beside cleaning our butt)?:

- No blockage in pipes
- No blockage in pumps
- Settles in the septic tank (does not washout towards the field or Treatment unit)
- Does not increase maintenance frequency



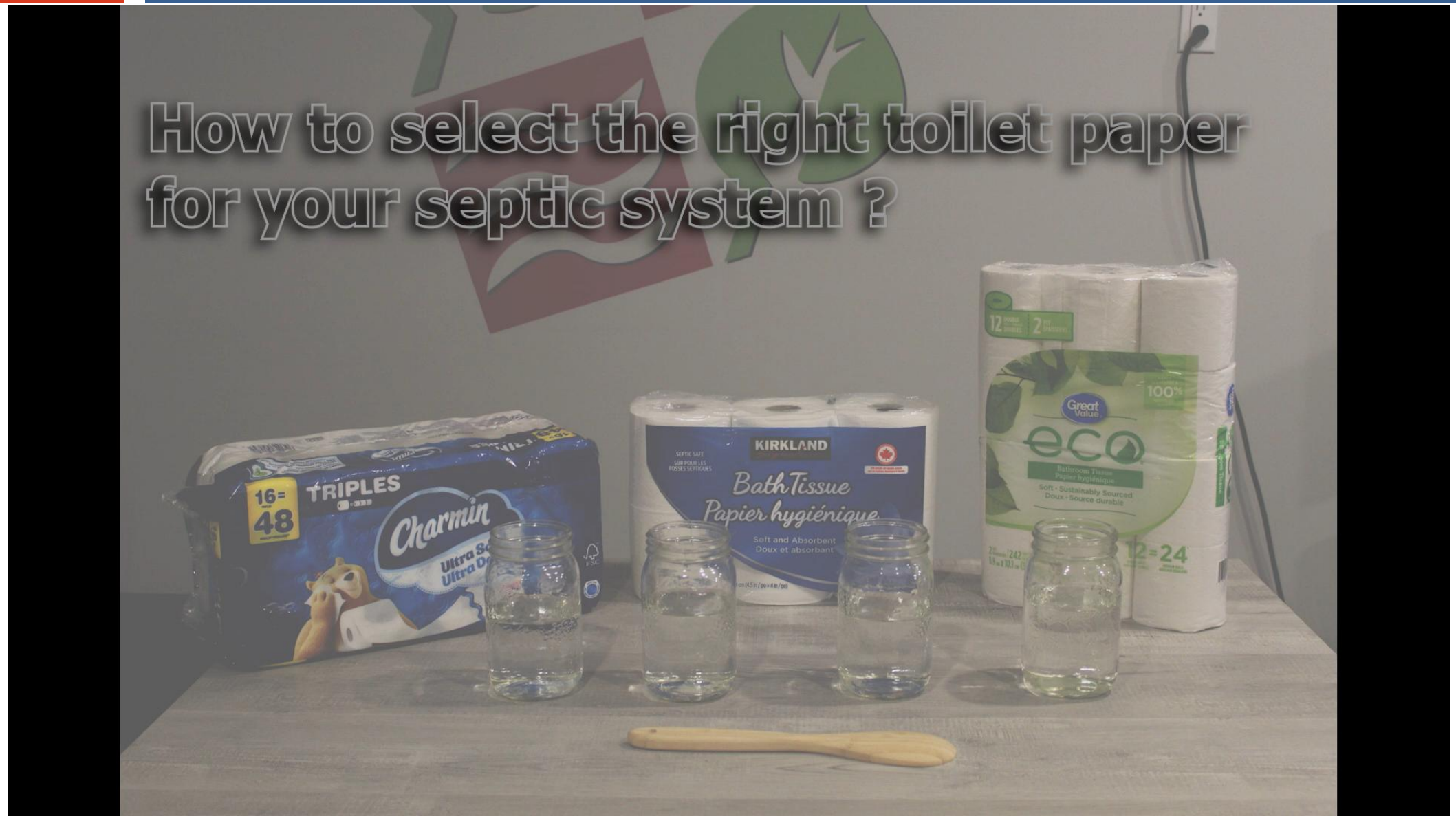
What characteristics could meet those expectations ?

- ✓ Fast degradation in contact with water (avoid blockage in pipes and pumps)
- ✓ Maximal degradation in water (breaks down completely)
- ✓ Settles in the septic tank

Toilet Paper Impacts on Septic Systems

Are those expectations always met ?

Toilet Paper Impacts on Septic Systems



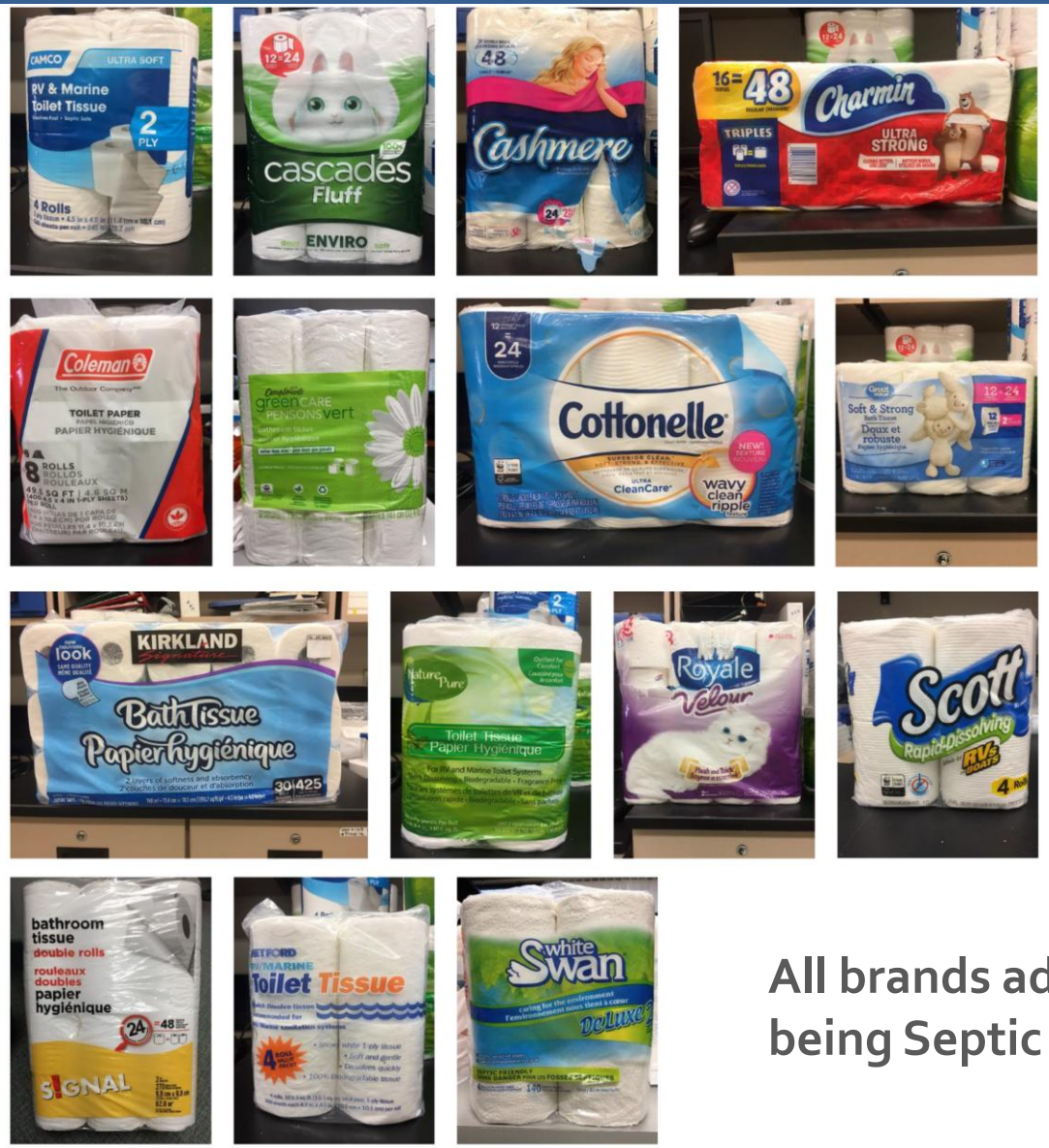
Not all toilet papers are created equal !

Source: YouTube: https://www.youtube.com/shorts/9FQbFGqwUv8

STUDY ON THE DEGRADATION OF HYGIENIC PAPER IN A SEPTIC TANK ENVIRONMENT (Enviro Neptune and Fleming College)

Brands of paper tested :

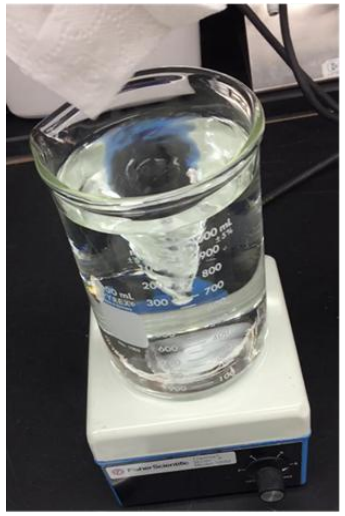
1. Camco RV / Marine
2. Cascades Fluff
3. Cashmere
4. Charmin
5. Coleman RV
6. Compliments Green Care
7. Cottonelle
8. Great Value
9. Kirkland
10. Nature Pure RV / Marine
11. Royale Velour
12. Scott RV
13. Compliment Signal
14. Thetford RV /Marine
15. White Swan

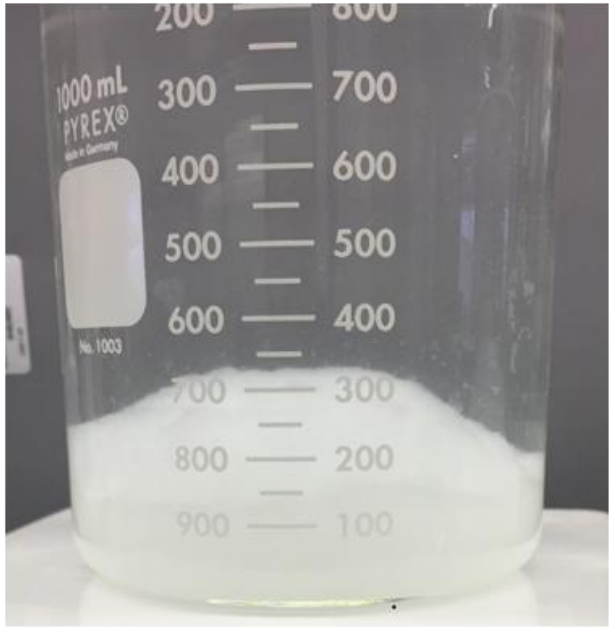


All brands advertise as being Septic Friendly

Phase 1 observations…all over the place !

- 6 of 15 floated after 30 min
- 1 of 15 stayed suspended after 30 min
- 7 of 15 settled after 30 min
- 1 of 15 was 50/50 after 30 min
- 3 of 15 settled but particles were back into suspension after 30 min





Results – Phase 2 and 3 :

- 6 flush of 6 liters per day
- 30 consecutive days
- Tap water(2), effluent (3)

Brand	Phase 2 Paper Behaviour (Particle Size)	Phase 2 Settled Paper Depth (cm)	Phase 2 Outflow Obstructions (Clogging)
Camco	Intermediate	12	3
Cascades Fluff	Intermediate	9	1
Cashmere	Int - Clumpy	8	0
Charmin	Large	11	3
Coleman	Small	9	2*
Compliments GC	Small	9	1
Cottonelle	Large	10	0
Great Value	Very Small	6	0
Kirkland	Int-Clumpy	10	2
Nature Pure	Small	9	1
Royale Velour	Small	10	2
Scott RV	Int-Clumpy	6	1
Signal	Small	9	1
Thetford	Large	12	3
White Swan	Small	10	1

Phase 2 and 3 observations :

- Papers behave differently in water. No common trend. No common characteristics.
- Caution: some papers have a greater risk of blockage !
- Papers breaking down in larger particles resulted in a thicker layer of solids
- Charmin and Kirkland (2 of the largest seller in the US and Canada) accounted for the most blockages (in the non-RV brands)

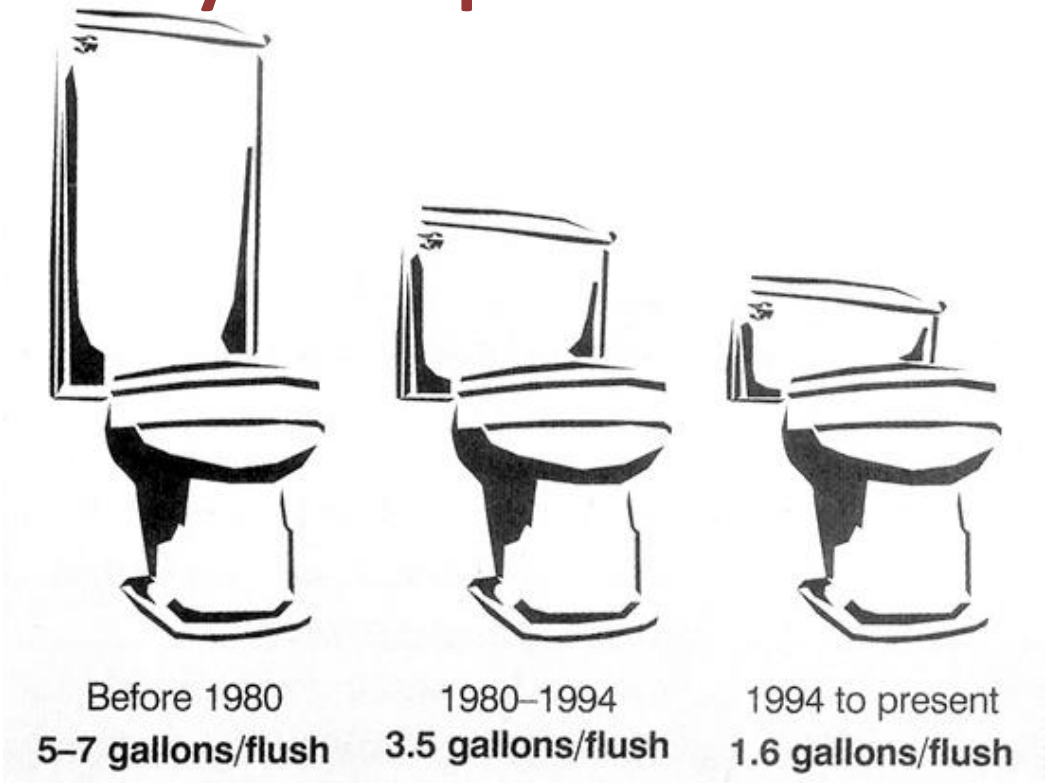
Bottom line :

- Homeowner should be informed of the potential impacts of toilet papers, facial tissues and cleaning wipes discharged to septic systems to make better decisions.
- For a lot of papers, claim to be septic friendly is disputable.
- A quick and easy homemade test in a jar can give valuable information about toilet paper degradation behavior in water. We look for quick and complete breakdown.
- Annual inspection of all types of systems is a good way to prevent problems such as back-ups, blockages and solid washouts to leaching field or treatment unit.
- Reduction of toilet paper use (like the use of a bidet) can have positive impacts on septic tank maintenance while reducing water use.

PART 2: Low flow fixtures and reduced domestic water use impacts on septic systems

From Research to Applied Design Criteria

Huge gap between technology development (moving fast) and policy changes (moving slow). Our policies are based on data 20 to 30 years old, are we sure they are representative of today's reality ?



Review of actual onsite design criteria

Examples of design flow rates (residential applications) :

	Ontario	Québec	Alberta	Nova Scotia	BC
1 bedroom	750 L/d	540 L/d	680 L/d	1000 L/d	700 L/d
2 bedrooms	1100 L/d	1080 L/d	1360 L/d	1200 L/d	1000 L/d
3 bedrooms	1600 L/d	1620 L/d	1530 L/d	1350 L/d	1300 L/d
4 bedrooms	2000 L/d	2160 L/d	2040 L/d	1500 L/d	1600 L/d
5 bedrooms	2500 L/d	2700 L/d	2550 L/d	1850 L/d	1900 L/d
6 bedrooms	3000 L/d	3240 L/d	3060 L/d	2200 L/d	2200 L/d

Except for NS and BC, most regulations account for 250 to 400 L/person

Domestic water use

Canada residential water use

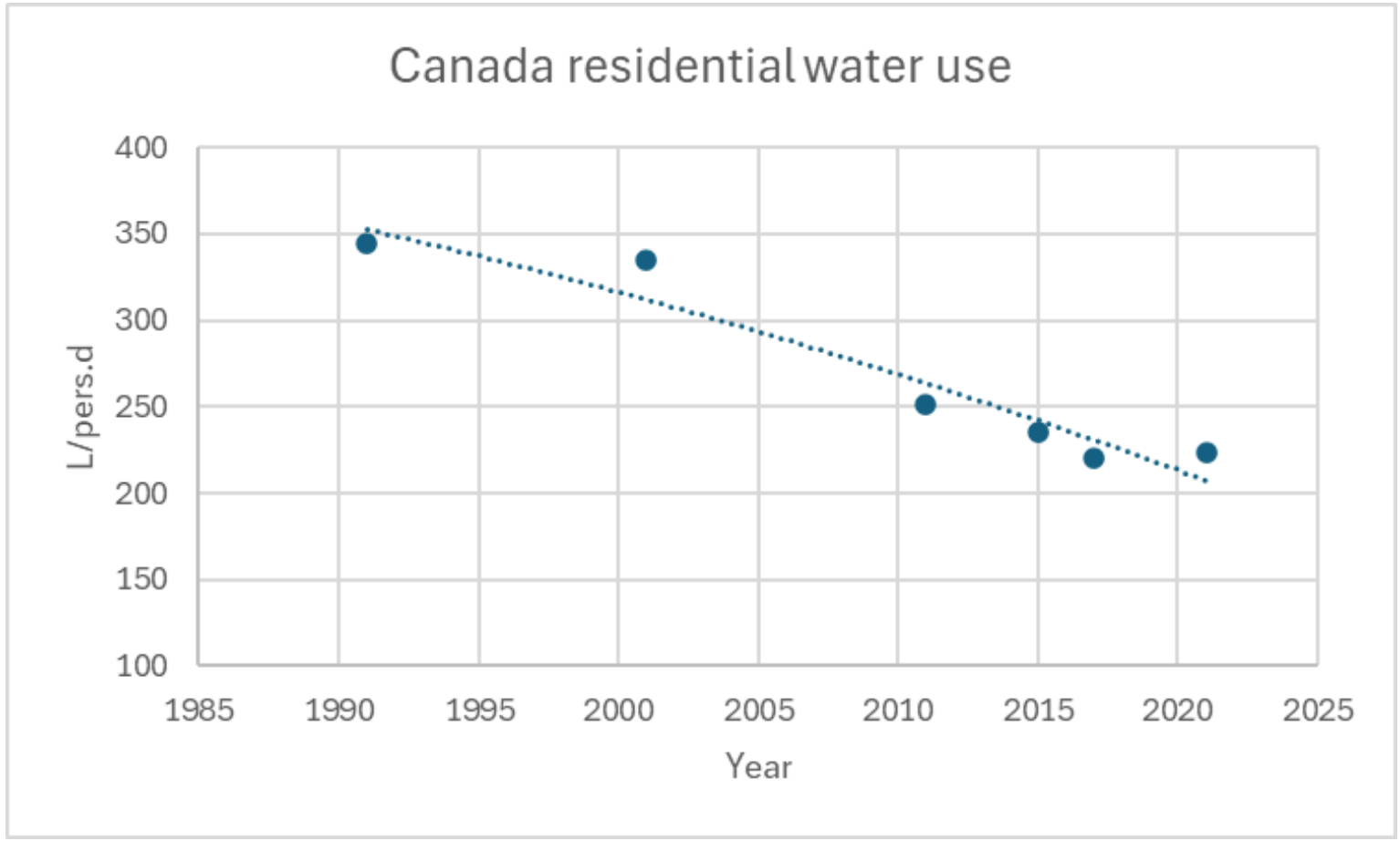
Official statistics :

- ✓ 1991: 341 L/pers.d (91 gppd)
- ✓ 2001: 335 L/pers.d (88 gppd)
- ✓ 2011: 251 L/pers.d (66 gppd)
- ✓ 2015: 235 L/pers.d (62 gppd)
- ✓ 2017 :220 L/pers.d (58 gppd)
- ✓ 2021: 223 L/pers.d (59 gppd)

<u>-35% from 2000 (25years)</u>

2021 slight increase was attributed to more people working from home (COVID)

Source: StatCan.



Review of actual onsite design criteria

Examples of Wastewater Concentrations published in Standards (residential applications):

	N. Carolina	Minnesota	Texas	New York	Ontario (Can)
BOD_5	350 mg/l (raw) 150 mg/l (STE)	300 mg/l (raw) 170 mg/l (STE)	- 140 mg/l (STE)	100-300 mg/l (raw) -	100-300 mg/l (raw) (200 mg/l average raw)
TSS	200 mg/l (raw) 100 mg/l (STE)	200 mg/l (raw) 60 mg/l (STE)	-	100-350 mg/l (raw)	100-350 mg/l (raw) (200 mg/l average raw)
TKN	100 mg/l (raw)	-	-	-	35-70 mg/l (raw)
	15A NCAC 18A.1969 paragraph m)	Chapter 7080, Individual Subsurface Sewage Treatment Systems	On-Site Sewage Facility Rules Compilation §285.91(3)	Adheres to NSF Standard 40	Adheres to CAN/BNQ 3680-600

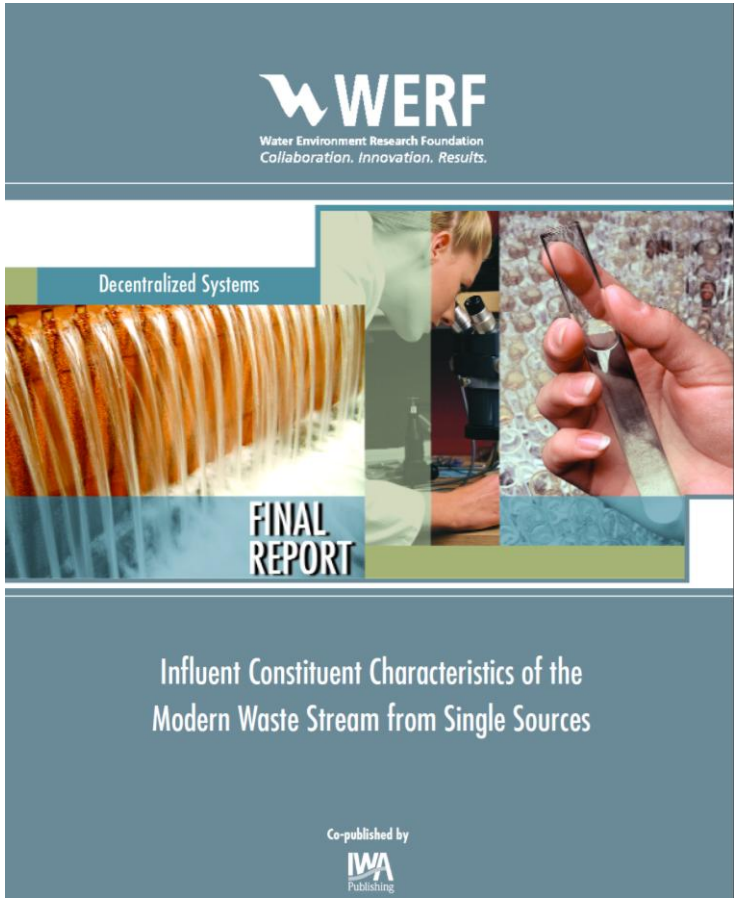
- Any technology can get NSF 40 (or BNQ) certified with a testing average BOD_5 of 200 mg/l
- Most testing facilities gets sewage from a communal system having BOD on the lower range

Evolution of the Domestic Water Use

WERF Study (2009…16 years already): **Influent Constituent Characteristics of the Modern Waste Stream from Single Sources**

Highlights - Flows :

- ✓ Refers a study done in 1999 by AWWA (1100 households monitored): median water use of 229 L/pers.d (60 gal)
- ✓ Own WERF study done in 2009 : Median value of indoor water use of 171 L/pers.d (45 gal)
  - ✓ Average per capita use for occupants >65 years old = 297 L/pers.d (78 gal)
  - ✓ Average per capita use for occupants <65 years old = 148 L/pers.d (39 gal)
- ✓ Median decreased by 25% in a 10 years span



Impacts of reduced water use

WERF study (2009): Influent Constituent Characteristics of the Modern Waste Stream from Single Sources

Highlights - Sewage concentrations from residential source:

- ✓ Raw sewage TSS ranges from 22 to 1690 mg/l (all over the place).
- ✓ Septic tank effluent TSS: median value of 61 mg/l (good news, septic tank work !)
- ✓ $cBOD_5$ of raw sewage ranged from 112 to 1101 mg/l (average of 443 mg/l)
  (Our codes expect 200 to 350 mg/l, certification is given at 200 mg/l)
- ✓ $cBOD_5$ in Septic tank effluent ranged from 44 to 833 mg/l (average of 252 mg/l)
  (Our codes expect 150 to 200 mg/l)

Observations

- ✓ TSS from 2009 field data is higher than values used in most standards (26% to 68% greater)
- ✓ BOD_5 from 2009 field data is significantly higher than values used in most standards (50% to 120% greater)
- ✓ That trend is based on data collected 17 years ago. What is it Today ?

Impacts of reduced water use

- There is a clear trend in the US and Canada showing a reduction in domestic water use . This can be explained in parts by:
  - Water saving fixtures and appliances
  - Greater social awareness
  - Scarcity of water resource (in some locations)
  - Etc.
- Less water = less dilution = higher wastewater concentrations;

HOW DOES THIS IMPACTS SEPTIC SYSTEMS ?

Impacts – Low Flow

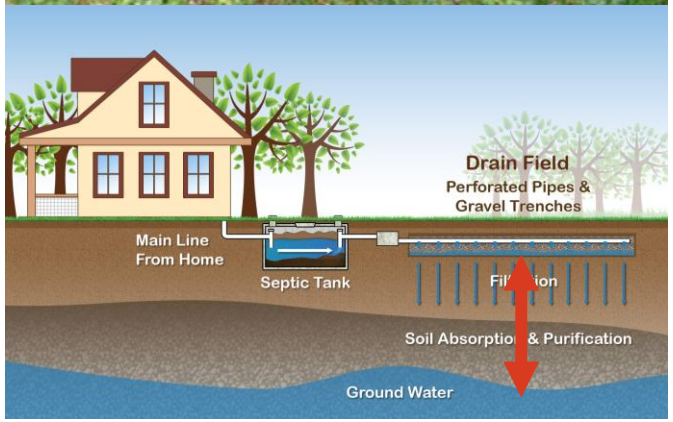
- **Low flow can increase risks of clogging by reducing velocity in plumbing pipes below what's required to "transport solids"**

- **Low flow results in shorter distances travelled in distribution pipes resulting in using a fraction of the bed, increasing the risks of overloading, reduced performances and reduced longevity**

- **Low flow lowers the temperature in septic tanks in winter. Higher risk of freezing and lower efficiency of treatment systems**

Impacts – Higher Concentrations

- **Higher strength combined with bad and non uniform distribution over the bed = overloading parts of the bed = risk of ponding, odor, contamination**
- **Higher strength speedup the clogging process resulting lower life expectancy**
- **Higher strength can result in insufficient vertical separation to properly protect the water table from contamination**
- **Higher strength consumes more oxygen and reduces efficiency in badly vented systems**
- **Higher strength increases maintenance of treatment units by increasing sludge production and filter/media clogging.**



Adapting Septic System Designs

Enviro-STEP
Technologies Inc.

Adapting Septic System Designs

What can we do? :

- Educate our clients to make them “Pro-Maintenance”. Septic system maintenance is still viewed as a negative thing even if their septic system is often the most expensive infrastructure on the property and is expected to last over 20 years !
- Learn how the different technologies can be impacted by low flow and high concentrations. They may have been certified/tested under conditions different from those encountered in real life. Sometimes a safety factor maybe needed;
- Do not follow codes blindly. Designs must be adapted to reality.
- Make effluent distribution a top priority. Use 100% of your bed !
- When dealing with higher concentrations, it is even more important to assure good venting to replenish the system with oxygen constantly. This is critical for good performances and longevity
- When dosing effluent on a pumped system, use frequent smaller doses instead of fewer larger doses to let bacteria process the pollution. Use time dosing when possible. Reduce size of pump tank

Running out of slides

QUESTIONS