Contaminants of Emerging Concern, or CECs

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The term “contaminant of emerging concern” a term that has been used loosely since the mid-1990s by EPA and others to identify chemicals and other substances that have no regulatory standard, have been recently “discovered” in natural streams (often because of improved analytical chemistry detection levels), and potentially cause deleterious effects in aquatic life at environmentally relevant concentrations.

They are pollutants not currently included in routine monitoring programs and may be candidates for future regulation depending on their (eco)toxicity, potential health effects, public perception, and frequency of occurrence in environmental media. CECs are not necessarily new chemicals. They include pollutants that have often been present in the environment, but whose presence and significance are only now being evaluated.

Source: EPA White Paper (draft)

CECs include many types of chemicals:

• Persistent organic pollutants (POPs), such as polybrominated diphenyl ethers (PBDEs used in flame retardants, furniture foam, plastics, etc.), Perfluorooctanoic acid (PFOA - i.e. Teflon)

• Pharmaceuticals and personal care products (PPCPs), including a wide suite of human prescribed drugs (e.g., antidepressants, blood pressure), over-the-counter medications(e.g., ibuprofen), bactericides (e.g., triclosan), sunscreens, synthetic musks;

• Veterinary/agricultural medicines such as antimicrobials, antibiotics, anti-fungals, growth promoters and hormones;

• Endocrine-disrupting chemicals (EDCs) capable of modulating normal hormonal functions and steroidal synthesis in aquatic organisms;

- Microbeads, and

- Many, many more……..

Presentation Outline

- Origin in the Environment
- Environmental Fate
- Aquatic Life and Human Health Issues
- Local Issues
- What Can Be Done?
- Regulatory Issues (time permitting)

How Do CECs Enter the Environment?

CEC Manufacturing Process

- Multimedia Sources including industrial wastewater, solid and hazardous waste and air emissions

How Do CECs/PPCPs Enter the Environment?

- Agricultural use of hormones, steroids and antibiotics

How Do CECs/PPCPs Enter the Environment?

Human Pathway

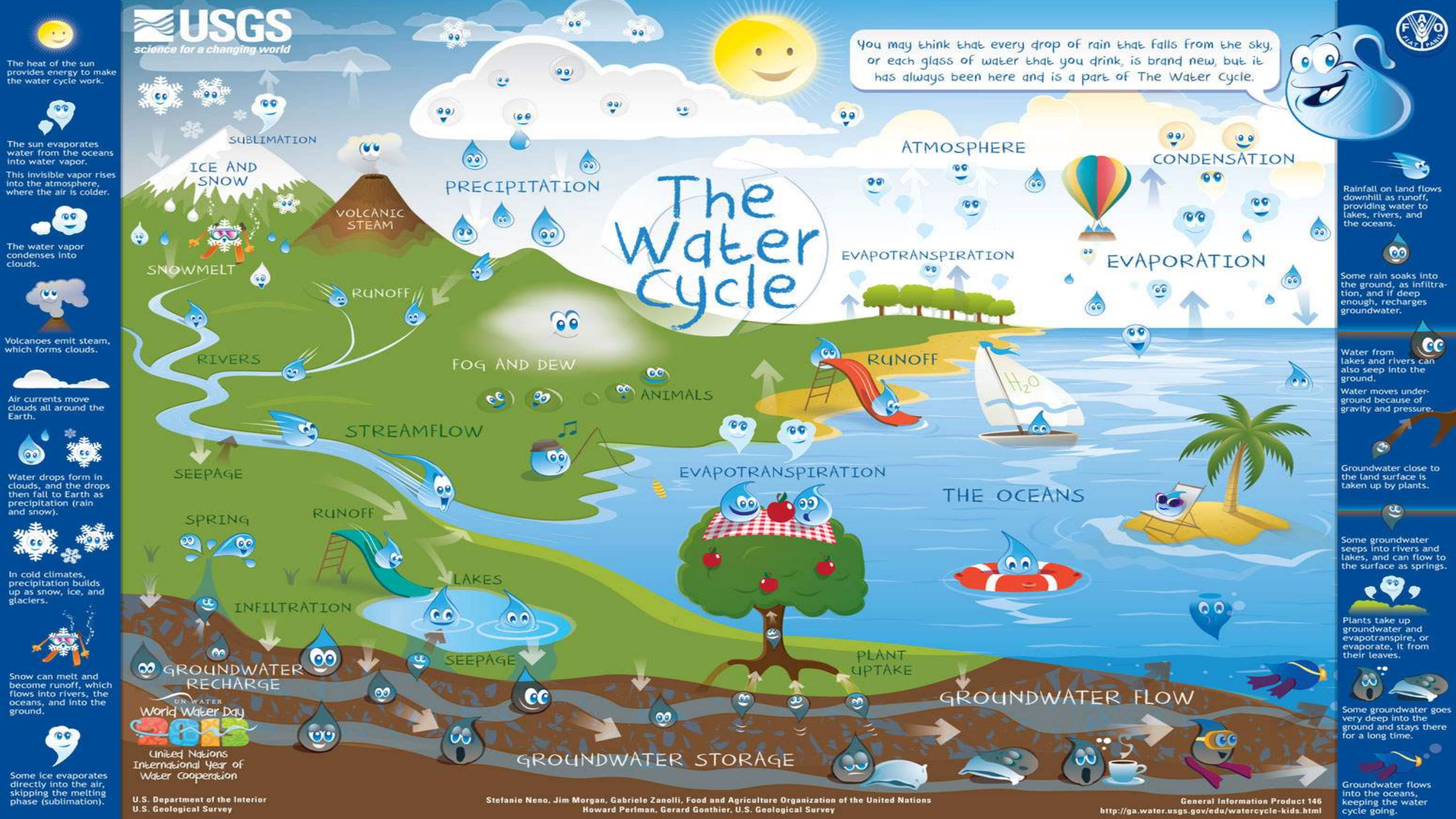
- Few pharmaceuticals are wholly retained in your body
- Up to 90% of some pharmaceuticals pass through your body
- Many PPCPs are washed down sink or shower

- Discharge to the Environment – Soil and Water
  - On-site Septic Systems
  - Municipal Wastewater Treatment Plants
    - direct discharge
    - land application

- Systems Designed to Treat the 3 Ps, not 1000s of synthetic chemicals

How Do CECs/PPCPs Enter the Environment?

- sanitary and industrial landfills



U.S. Department of the Interior
U.S. Geological Survey

Stefanie Neno, Jim Morgan, Gabriele Zanolli, Food and Agriculture Organization of the United Nations
Howard Perlman, Gerard Gonthier, U.S. Geological Survey

General Information Product 146
http://ga.water.usgs.gov/edu/watercycle-kids.html

Wimberley Valley Testing 2013-14

name	sample_date	analysis_method	chemical_name	result_text	Conc	result_uni
Blanco Upstream of Cyprus Creek	9/18/2014 0:00	E1698	17a-Estradiol	<0.810	<0.810	ng/l
Blanco Upstream of Cyprus Creek	9/18/2014 0:00	E1698	17a-Ethynyl Estradiol	<4.71	<4.71	ng/l
Blanco Upstream of Cyprus Creek	9/18/2014 0:00	E1698	17b-Estradiol	5.26	5.26JB	ng/l
Blanco Upstream of Cyprus Creek	9/18/2014 0:00	WS-MS-0010	Bisphenol-A	<0.305	<0.305	ug/l
Blanco Upstream of Cyprus Creek	9/18/2014 0:00	E1698	Caffeine	55.9	55.9	ng/l
Blanco Upstream of Cyprus Creek	9/18/2014 0:00	E1698	Carbamazepine	<2.25	<2.25	ng/l
Blanco Upstream of Cyprus Creek	9/18/2014 0:00	E1698	Cotinine	<1.43	<1.43	ng/l
Blanco Upstream of Cyprus Creek	9/18/2014 0:00	E1698	DEET	30.6	30.6	ng/l
Blanco Upstream of Cyprus Creek	9/18/2014 0:00	E1698	Diltiazem	<0.441	<0.441	ng/l
Blanco Upstream of Cyprus Creek	9/18/2014 0:00	E1698	Equilenin	<0.625	<0.625	ng/l
Blanco Upstream of Cyprus Creek	9/18/2014 0:00	E1698	Estriol	<2.56	<2.56	ng/l
Blanco Upstream of Cyprus Creek	9/18/2014 0:00	E1698	Estrone	1.66	1.66JB	ng/l
Blanco Upstream of Cyprus Creek	9/18/2014 0:00	E1698	Fluoxetine	<10.0	<10.0	ng/l
Blanco Upstream of Cyprus Creek	9/18/2014 0:00	E1698	Gemfibrozil	<11.3	<11.3	ng/l
Blanco Upstream of Cyprus Creek	9/18/2014 0:00	E1698	Ibuprofen	<6.46	<6.46	ng/l
Blanco Upstream of Cyprus Creek	9/18/2014 0:00	E1698	Iopromide	<7.07	<7.07	ng/l
Blanco Upstream of Cyprus Creek	9/18/2014 0:00	E1698	Lincomycin	<5.12	<5.12	ng/l
Blanco Upstream of Cyprus Creek	9/18/2014 0:00	E1698	Naproxen	<17.4	<17.4	ng/l
Blanco Upstream of Cyprus Creek	9/18/2014 0:00	WS-MS-0010	Nonylphenol Diethoxylate (Technical mixture)	<1.86	<1.86	ug/l
Blanco Upstream of Cyprus Creek	9/18/2014 0:00	WS-MS-0010	Nonylphenol Monoethoxylate (Technical mixture)	<3.05	<3.05	ug/l
Blanco Upstream of Cyprus Creek	9/18/2014 0:00	WS-MS-0010	para-n-Nonylphenol	<0.248	<0.248	ug/l
Blanco Upstream of Cyprus Creek	9/18/2014 0:00	WS-MS-0010	para-tert-Octylphenol	<0.305	<0.305	ug/l
Blanco Upstream of Cyprus Creek	9/18/2014 0:00	WS-MS-0010	p-Nonylphenol (Technical mixture)	<1.52	<1.52	ug/l
Blanco Upstream of Cyprus Creek	9/18/2014 0:00	E1698	Progesterone	<1.02	<1.02	ng/l
Blanco Upstream of Cyprus Creek	9/18/2014 0:00	E1698	Sulfamethoxazole	<5.02	<5.02	ng/l
Blanco Upstream of Cyprus Creek	9/18/2014 0:00	E1698	Testosterone	<2.15	<2.15	ng/l
Blanco Upstream of Cyprus Creek	9/18/2014 0:00	E1698	Thiabendazole	34.3	34.3	ng/l
Blanco Upstream of Cyprus Creek	9/18/2014 0:00	E1698	Triclosan	<6.25	<6.25	ng/l
Blanco Upstream of Cyprus Creek	9/18/2014 0:00	E1698	Trimethoprim	<4.10	<4.10	ng/l
Blanco Upstream of Cyprus Creek	9/18/2014 0:00	E1698	Tylosin	<1.13	<1.13	ng/l

Wimberley Valley Testing 2013-14

Blanco Upstream of Cyprus Creek

Caffeine
DEET – insect repellent
Thiabendazole –treatment of pinworms

Cypress Creek Upstream of Blanco River

Caffeine
Cotinine – anagram of nicotine
DEET - insect repellent
Estrone - hormone used in estrogen replacement
Ibuprofen – Advil, Motrin

Blanco River at Wimberley

Caffeine
Diltiazem – treating high blood pressure
Thiabendazole - treatment of pinworms
Trimethoprim – treat urinary tract infections
Cotinine - anagram of nicotine
Equilenin - estrogenic steroid hormone
Ibuprofen - Advil, Motrin
Estriol – estrogen hormone
DEET - insect repellent
Estrone - hormone used in estrogen replacement

Aquatic Life and Human Health Issues

- Limited data
- Pharmaceuticals crafted for humans to treat a specific medical condition, not broadcast into the environment
- Testing procedures not well established for low level contaminants
  - Acute versus Chronic
- Many possible interactions between different chemicals
- Endocrine disruptors causing feminized male fish
- Pharmaceuticals affecting sentinel species such as earthworms in the wild and zooplankton in the laboratory
- Drug classes considered important to study; chemotherapy compounds, medicines for depression and epilepsy, antibiotics and pain relievers

Microbeads from Lake Michigan

8 trillion microbeads were entering the country's aquatic habitats daily

Microbead-Free Waters Act of 2015

(Sec. 2) This bill amends the Federal Food, Drug, and Cosmetic Act to ban rinse-off cosmetics that contain intentionally-added plastic microbeads beginning on January 1, 2018, and to ban manufacturing of these cosmetics beginning on July 1, 2017.

These bans are delayed by one year for cosmetics that are over-the-counter drugs.

(became law 12/28/2015)

What Can Be Done?

- Reduce or ban unnecessary CECs (microbeads)
- Source/Receptor Relocation
- Additional testing/research - through years of research, EPA just (May, 2016) issued a health advisor for PFOA and PFOA (Teflon)
- Proper disposal of surplus chemicals through local collection or take-back programs
- Public Awareness/Education - informational labelling
- Enforce New TSCA regulation

What compound was found in the urine of 93% of Americans tested?

Glyphosate

Source: Organic Consumers Association

Questions?