HYDROCARBONS

HYDROCARBONS

WHAT DO YOU THINK OF WHEN YOU HEAR THIS WORD?

Arctic Pipeline

Vehicles

Plastic Water Bottles

Oil Spill

Exhaust

Garbage

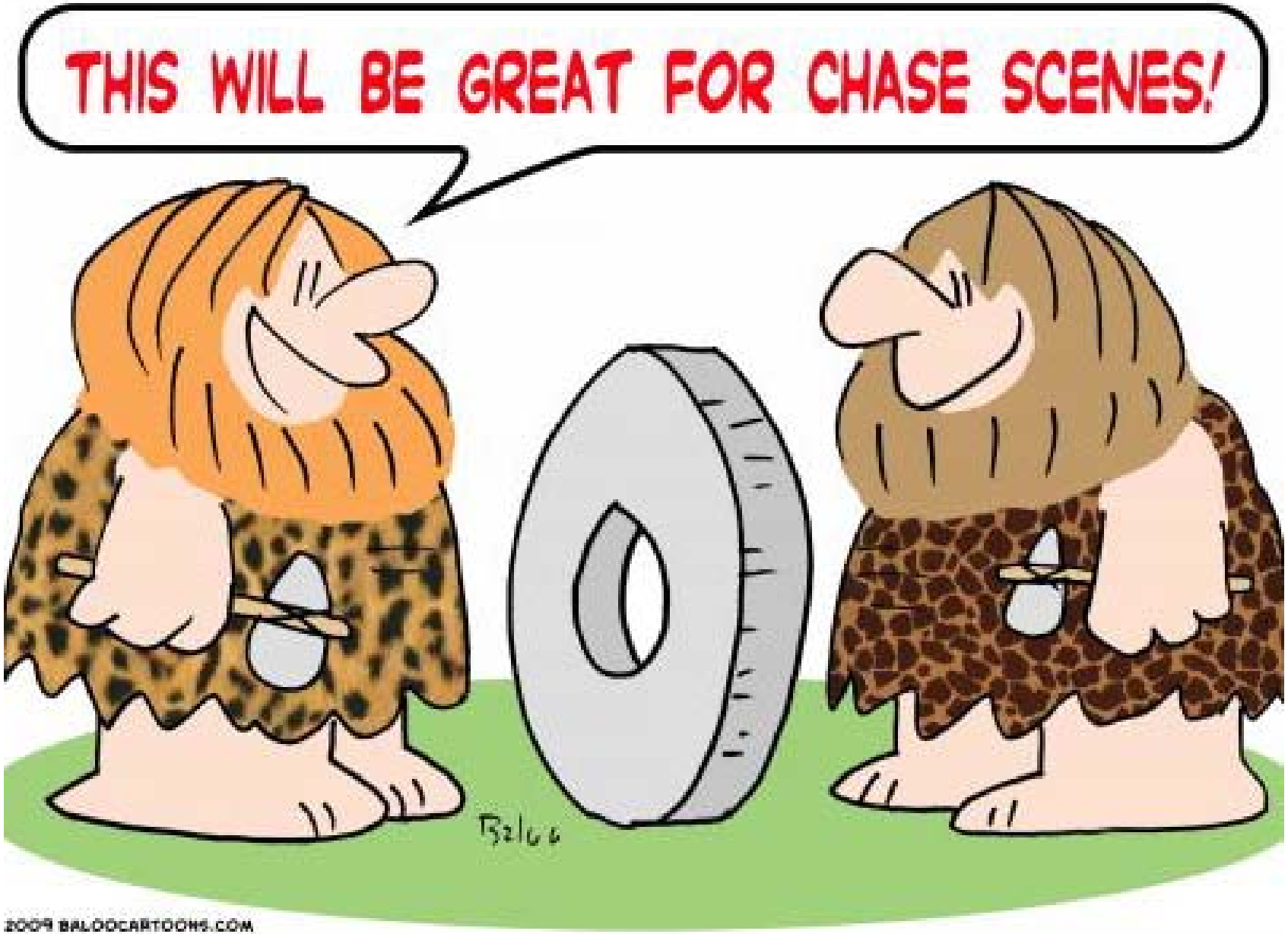
What does this all mean?

SHOULD WE BE AFRAID OF TOO MUCH HYDROCARBONS?

Climate Change

What does this mean?

SHOULD WE BE AFRAID OF DIMINISHING HYDROCARBONS?



No Technology

What are the things we value, the things we want to protect?

WHAT DO HYDROCARBONS HAVE TO DO WITH IT?

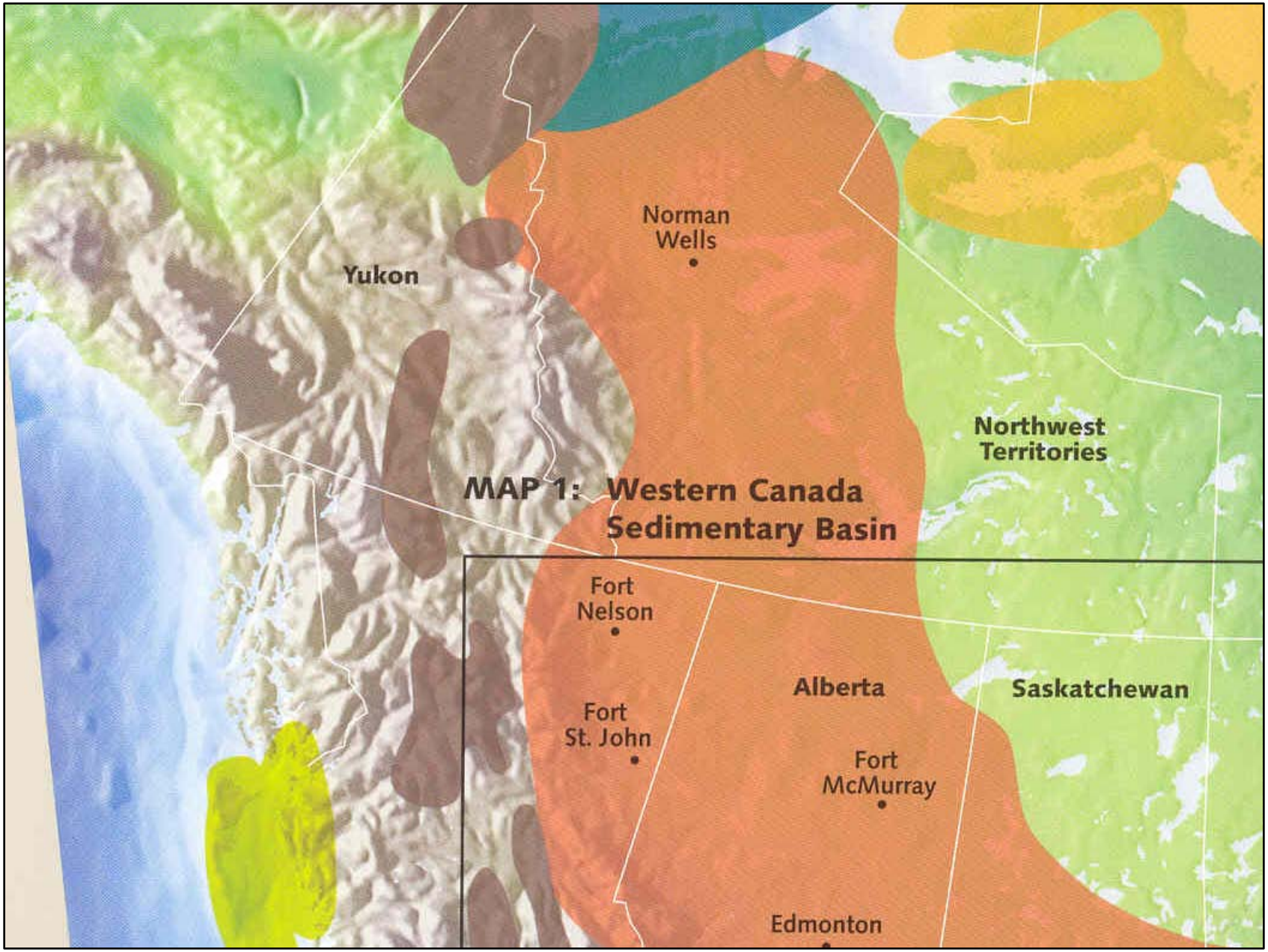
COMMODOTIES

RELATIONSHIPS

OPPORTUNITIES

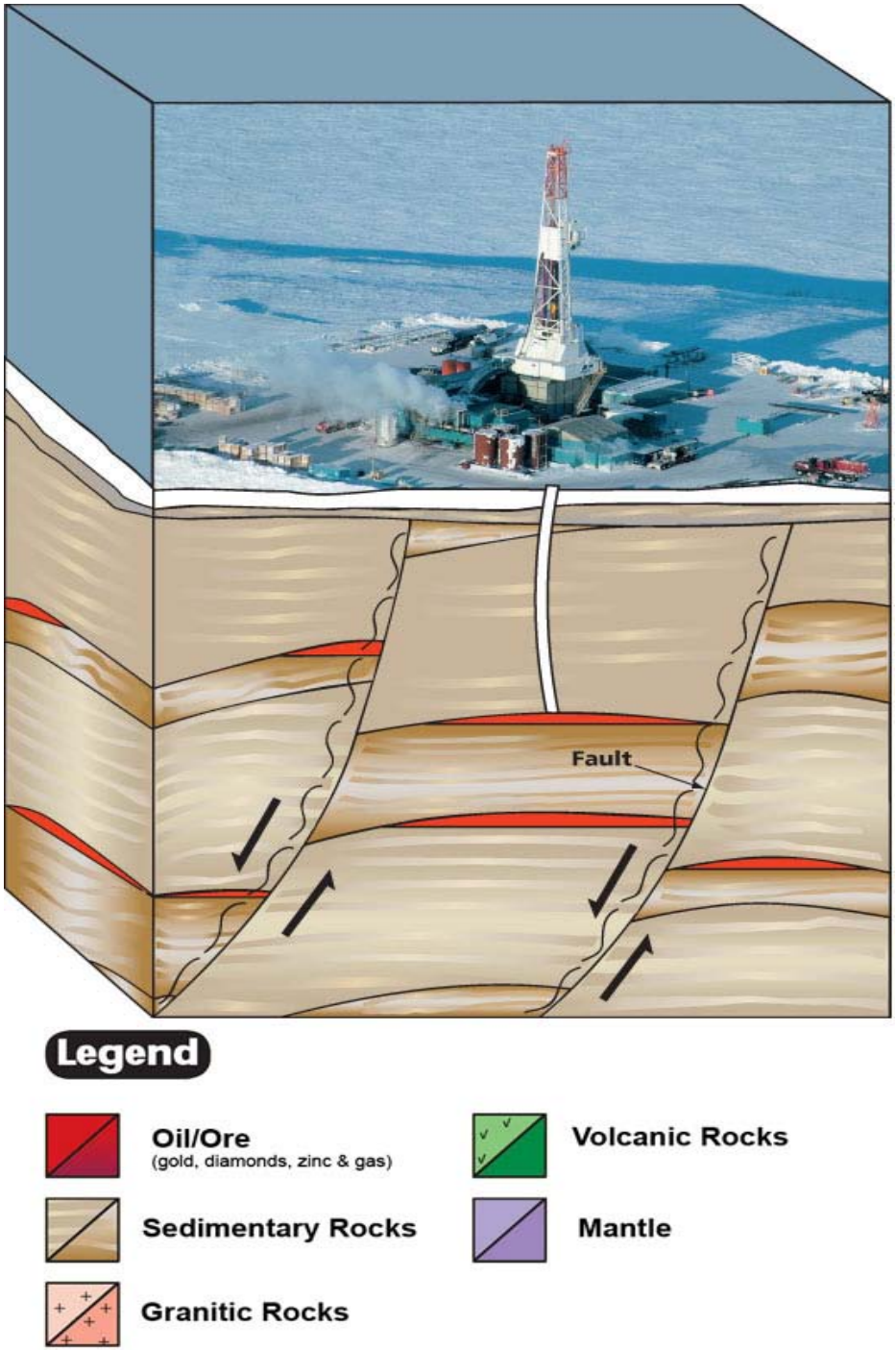
Why do we, the WLWB, need to know about Hydrocarbons?

WHAT TYPES OF DECISIONS DO WE MAKE REGARDING HYDROCARBONS?



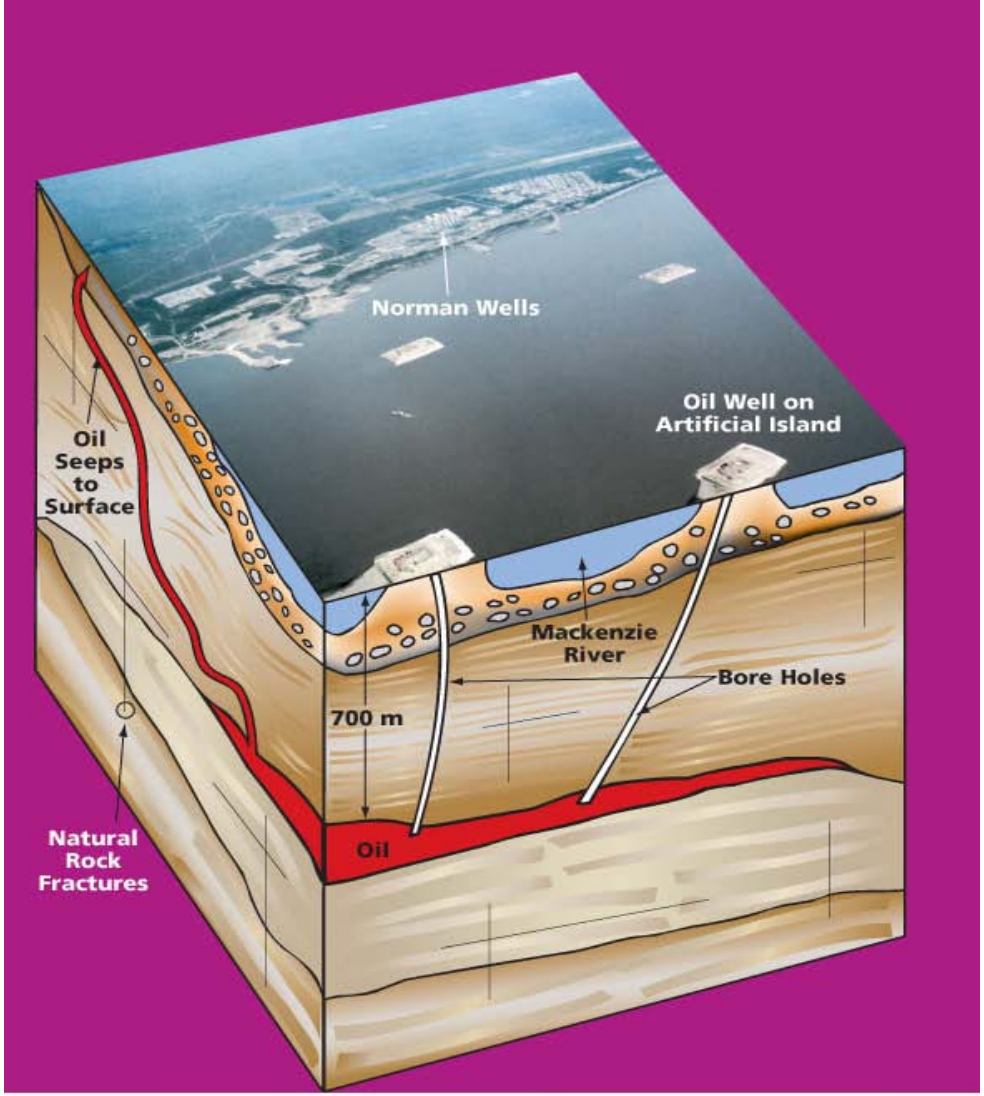
Applications for Oil & Gas

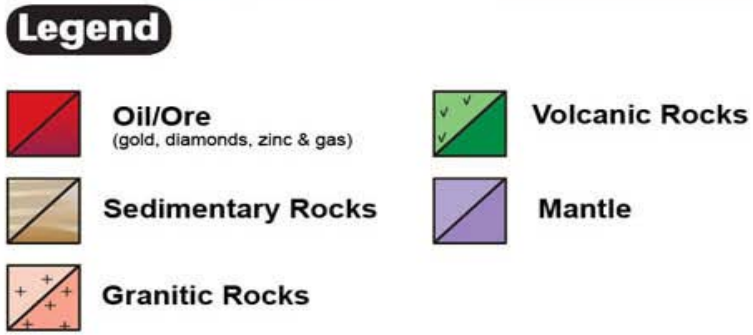
Gas in the Mackenzie Delta



Schreiner, D., Humphries, W., Baldwin, D., Bruce, K., Daniel, S., and Hauser, B., 2007.
Northwest Territories Geoscape: Rocks and Resources; NWT Educational Publication 2007-2, 1 poster.

Oil in Norman Wells





Schreiner, D., Humphries, W., Baldwin, D., Bruce, K., Daniel, S., and Hauser, B., 2007.
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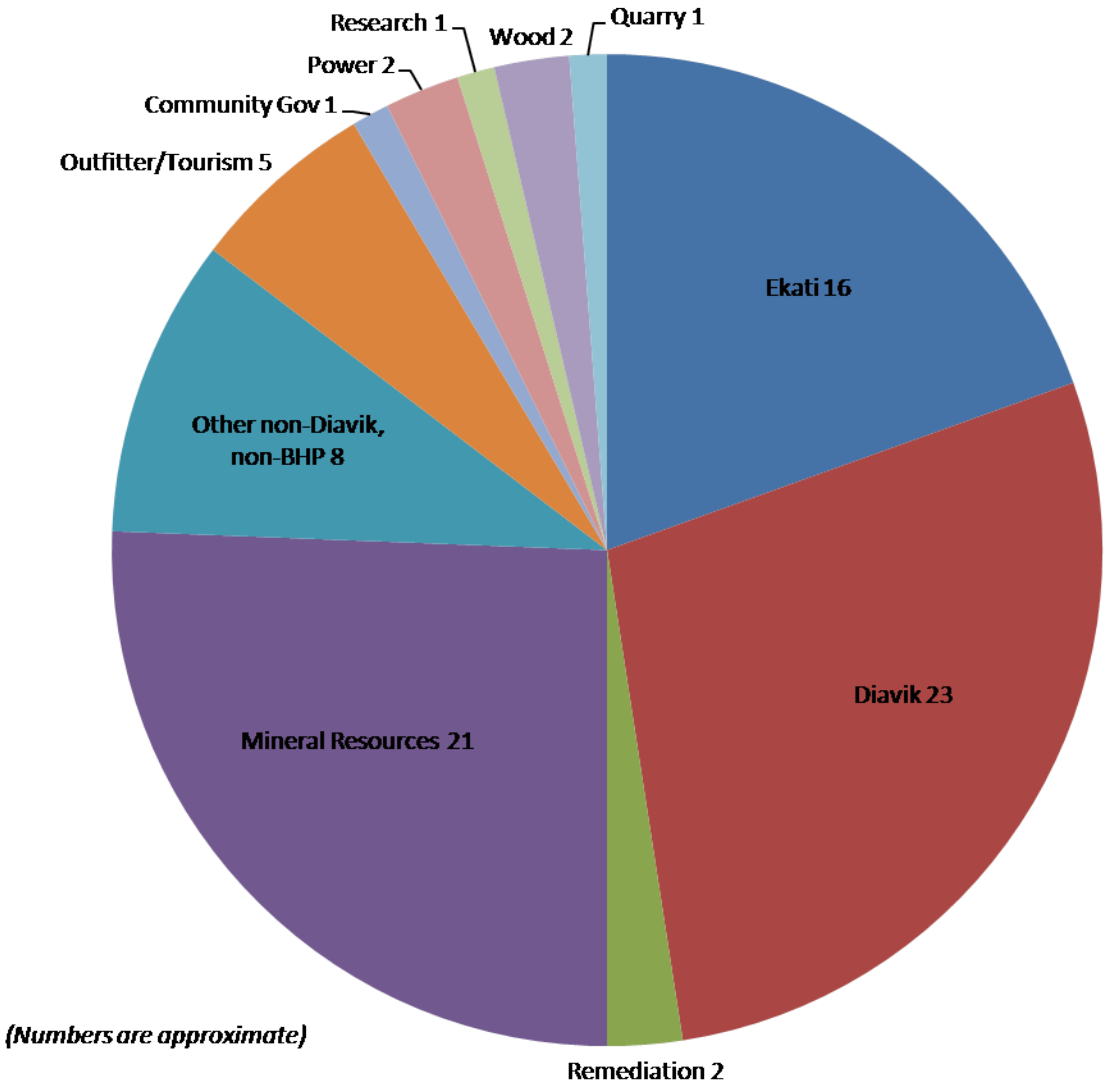
What do we regulate?



(Numbers are approximate)

What do we regulate?

Regulation

Water Licences

- Oil and Grease
- Hydrocarbons
- BTEX
- PAH
- Oil based drilling muds

Land Use Permits

- Spill response / contingency
- Fuel storage and containment
- Sumps
- Reporting fuel quantities

Oil, Grease, Hydrocarbons, BTEX, PAH, Fuel

Where should we start?

How do we treat?

How do we minimize?

How do we prevent?

What information do we need?

Production

We need to start at the beginning

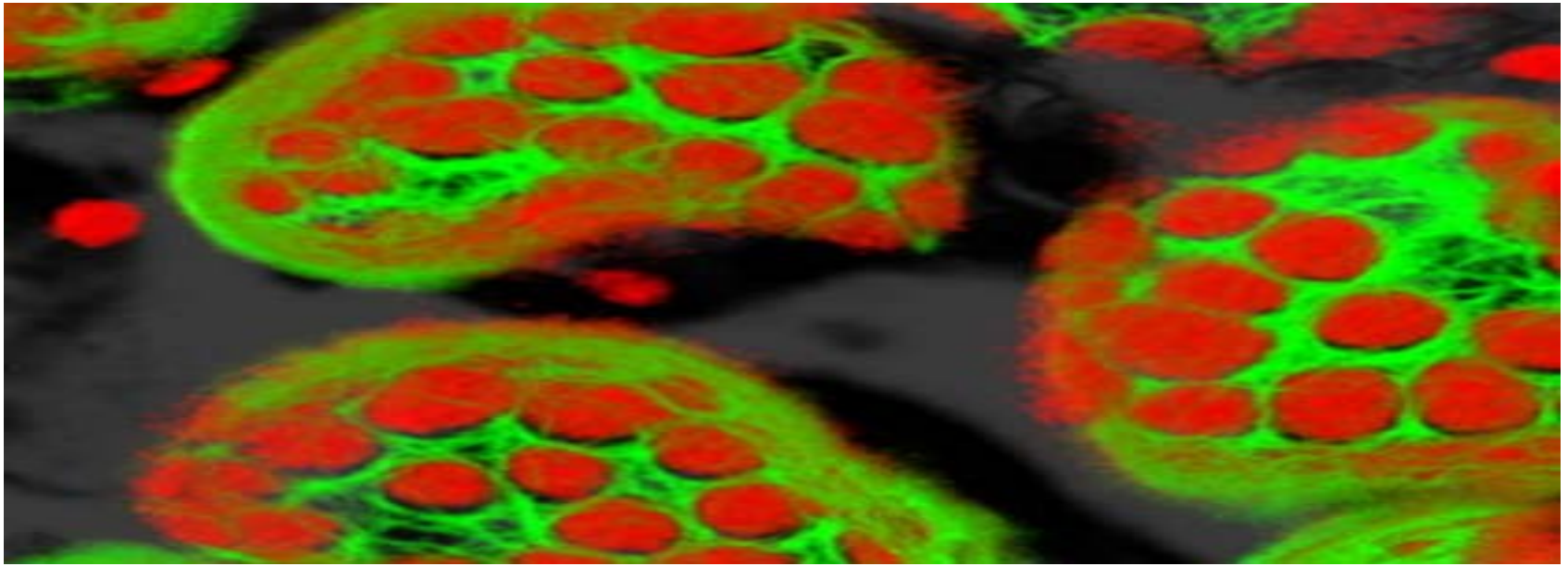
The Rocks

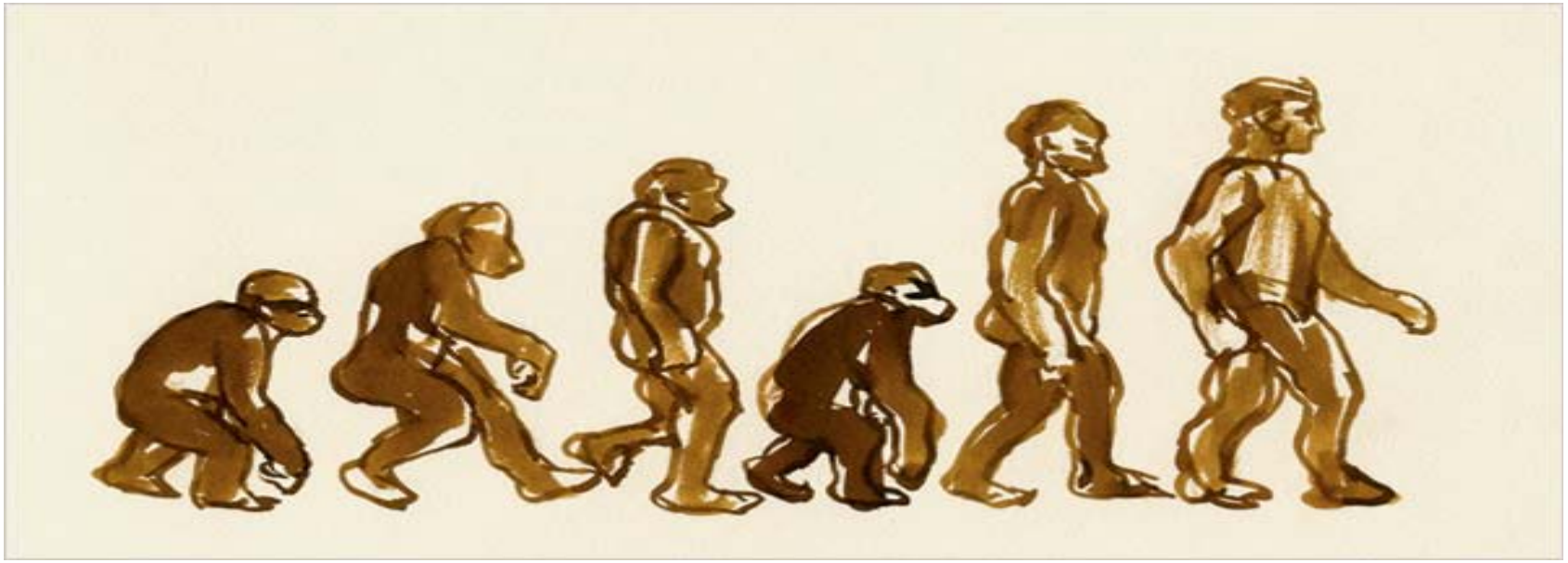
We need to start at the beginning

Environment of formation

We need to start at the beginning

Life on Earth





We need to start at the beginning

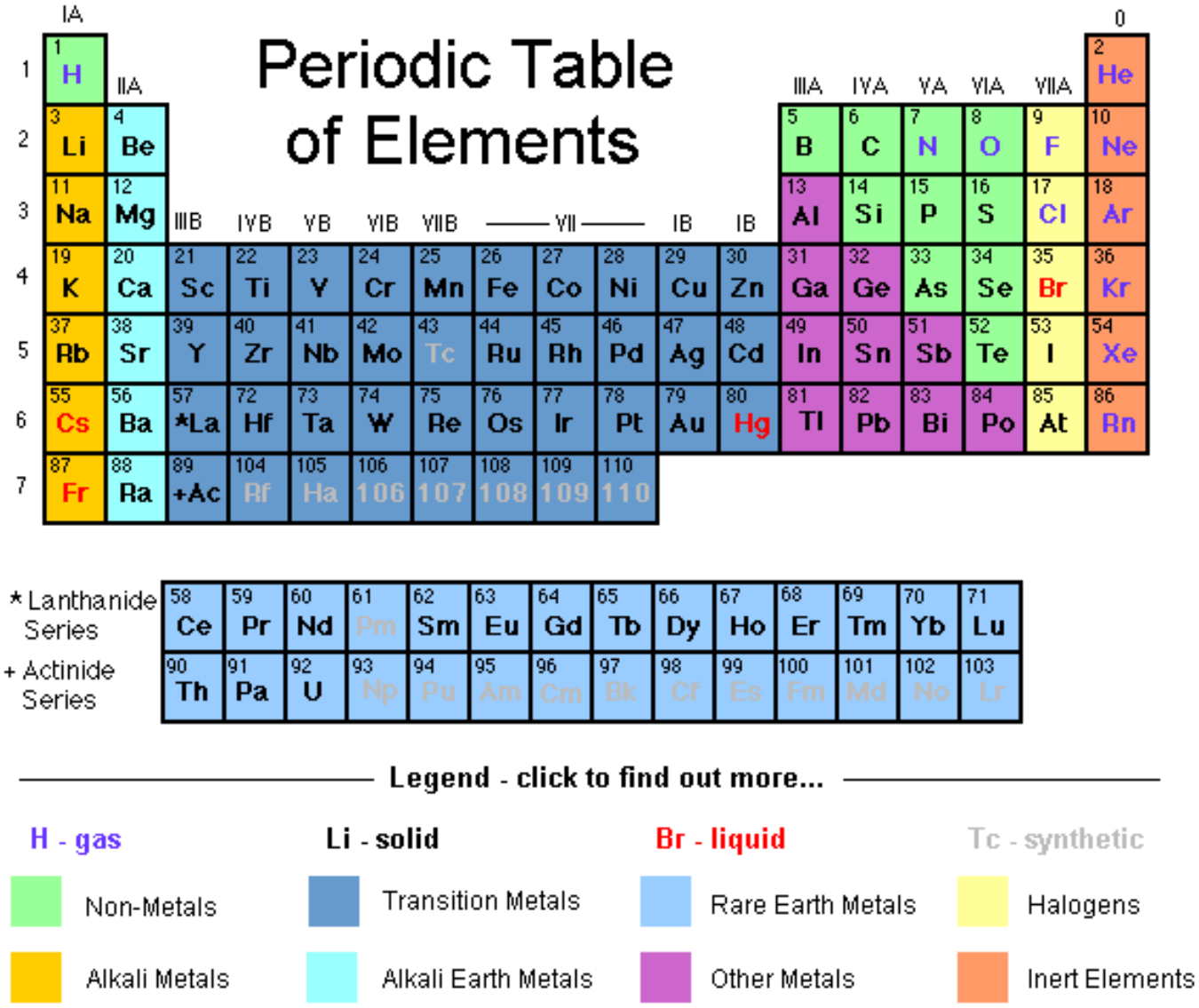
Earth

We need to start at the beginning

The Universe

We need to start at the beginning

The Building Blocks



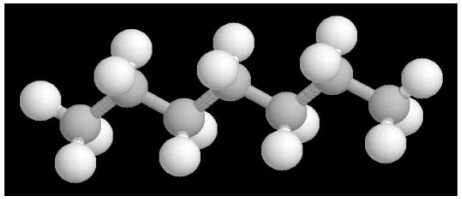
We need to start HERE

Oil, Grease, Hydrocarbons, BTEX, PAH, Fuel

HYDROCARBON PRODUCTS:
Oil, Grease, Fuel

HYDROCARBONS:

BTEX, PAH



COMBINATION OF ELEMENTS:

Recipe & Shape

Oil, Grease, Hydrocarbons, BTEX, PAH, Fuel

What are Hydrocarbons?

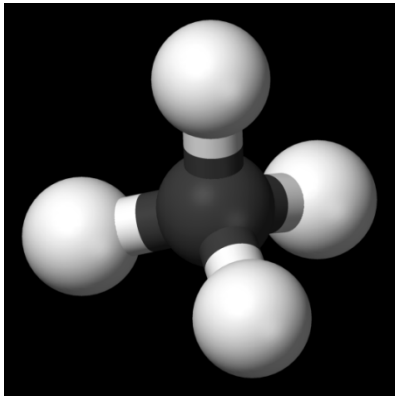
HYDROCARBONS ARE COMPOSED OF HYDROGEN AND CARBON ELEMENTS

The properties of the Hydrocarbon will depend on:

- The recipe (Carbon-Hydrogen ratio)
- The shape (Carbon-Hydrogen bonds)

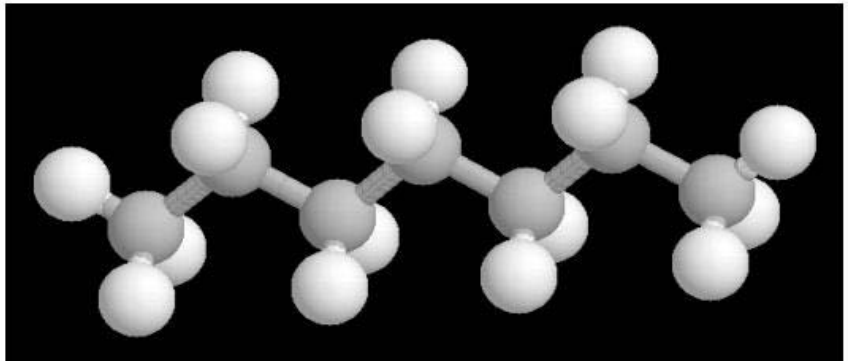
Hydrocarbon Recipe

< 5 Carbons = Gas



Methane

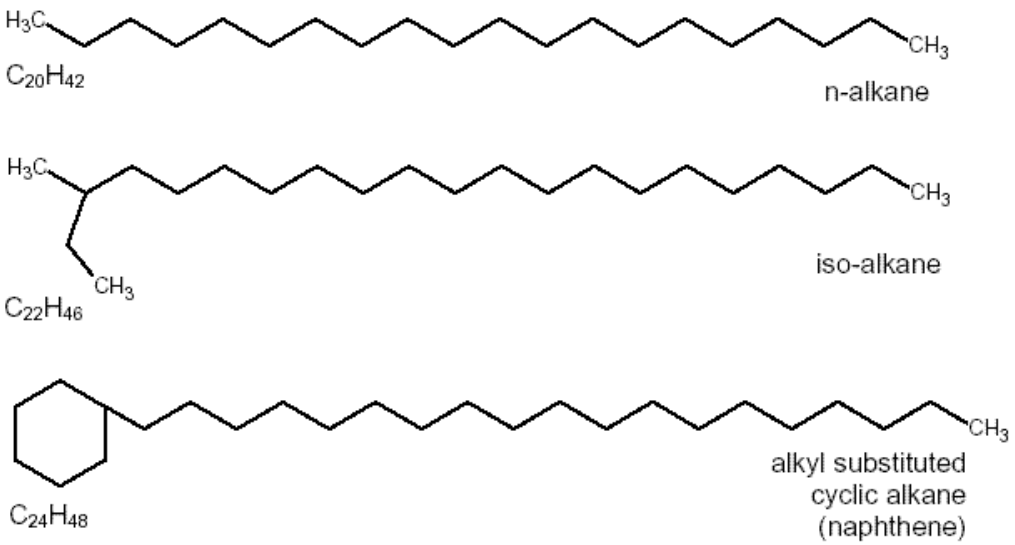
5-17 Carbons = Liquid



Heptane

Hydrocarbon Recipe

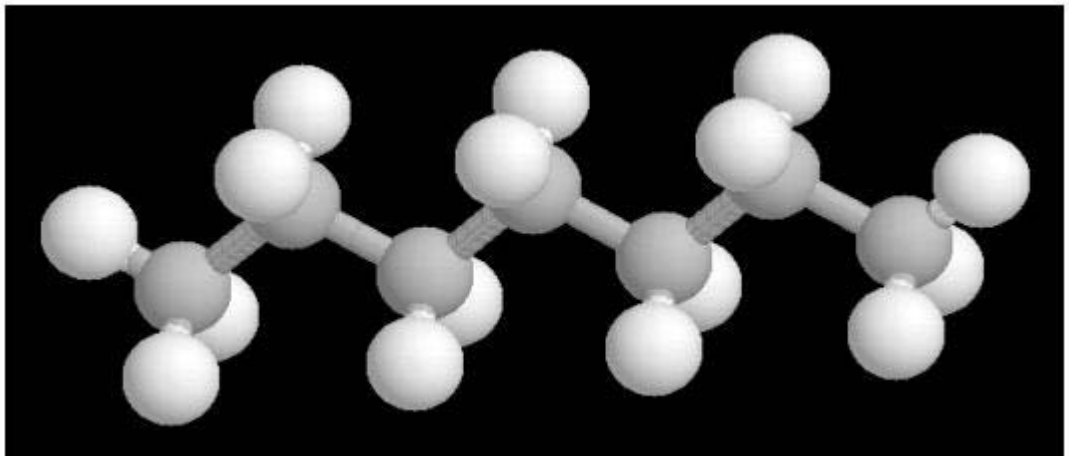
20-35 Carbons = Waxes



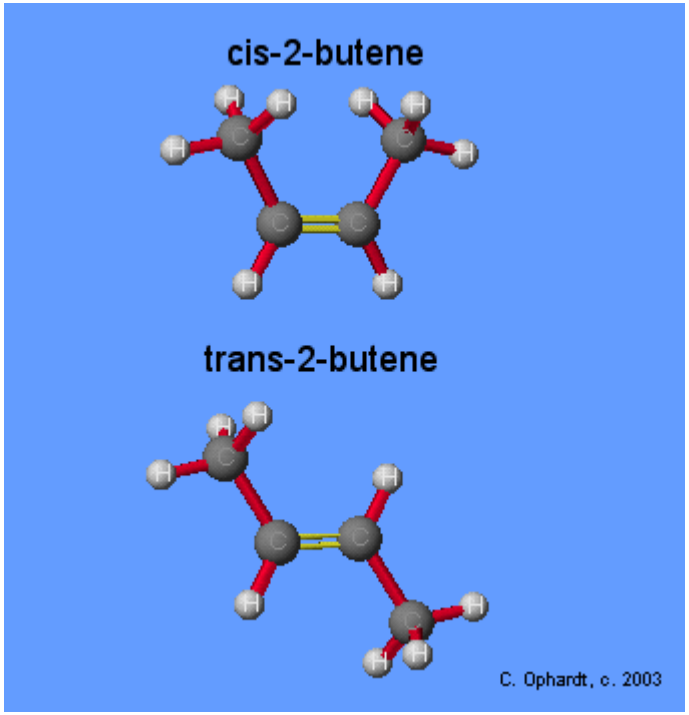
Paraffin Wax

Hydrocarbon Shape

- Bonds (single, double or triple)
- Arrangements (chains or rings)



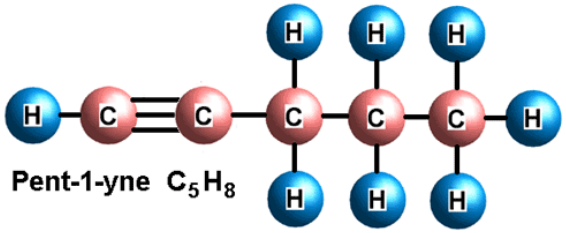
Single Bond Chain

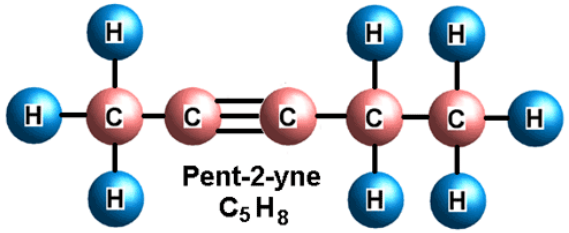


Double Bond Chain

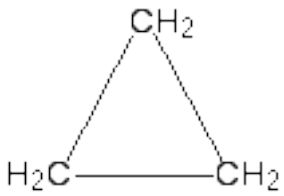
Hydrocarbon Shape

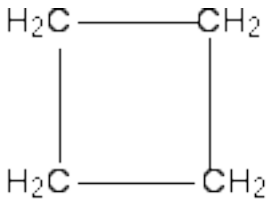
- Bonds (single, double or triple)
- Arrangements (chains or rings)

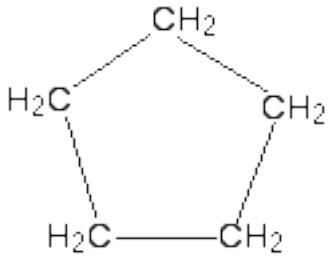


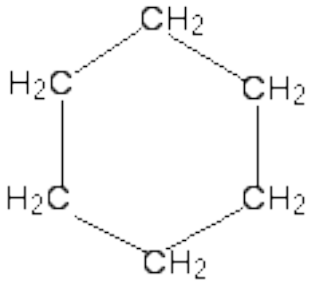


Triple Bond Chain









Single Bond Chain

Oil, Grease, Hydrocarbons, BTEX, PAH, Fuel

What are Hydrocarbons?

HYDROCARBONS ARE HYDROGEN AND CARBON ELEMENTS

Their properties will depend on the recipe and shape

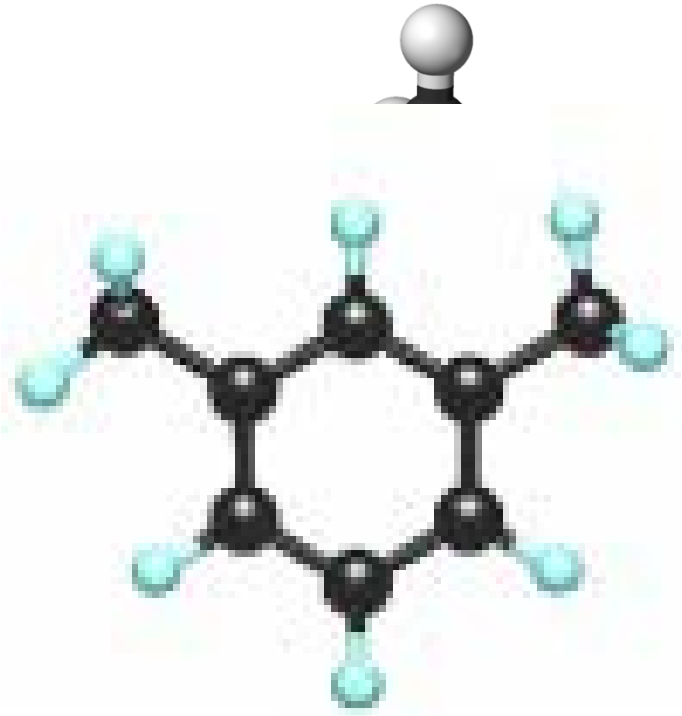
* All Living Matter is Made Up of Carbon and Hydrogen Elements

Oil, Grease, Hydrocarbons, BTEX, PAH, Fuel

What are BTEX and PAH?

BTEX AND PAH ARE HYDROCARBONS WITH SPECIFIC RECIPES AND SHAPES

EXAMPLE

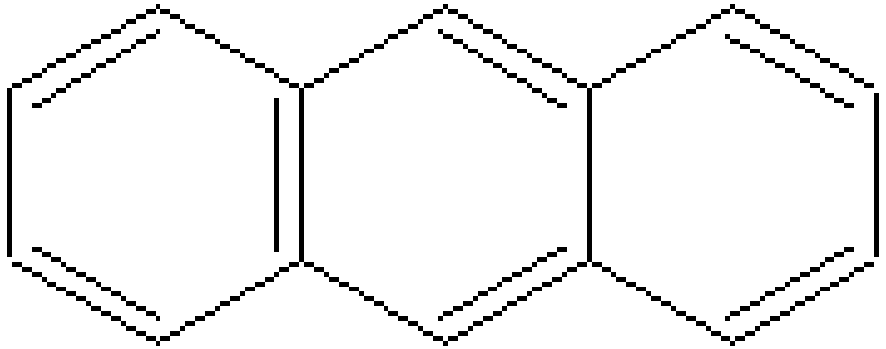


BTEX

- **Benzene**
- **Toluene**
- **Ethylbenzene**
- **Xylene**

PAH (Polynuclear Aromatic Hydrocarbon Group)

- **Naphthalene**
- **Anthracene**
- **Pyrene**
- **Coronene**



anthracene

Oil, Grease, Hydrocarbons, BTEX, PAH, Fuel

Oil, Grease, Hydrocarbons, BTEX, PAH, Fuel

What are BTEX and PAH?

BTEX AND PAH ARE HYDROCARBONS WITH SPECIFIC RECIPES AND SHAPES

BTEX = 1 RING BONDED TO CHAINS

PAH = >1 RING

These recipes and shapes can cause concern in the environment

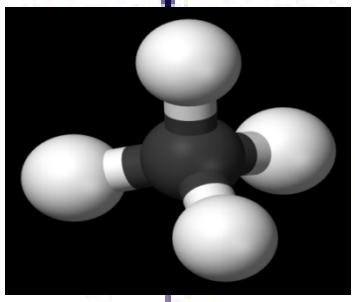
Oil, Grease, Hydrocarbons, BTEX, PAH, Fuel

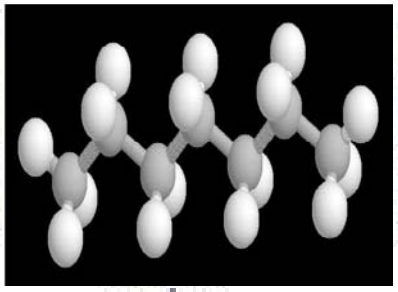
What are Oil, Grease, and Fuel?

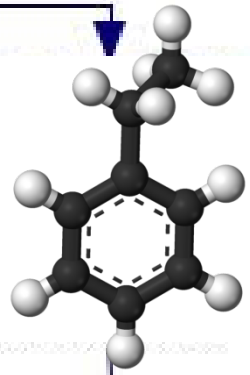
OIL, GREASE, AND FUEL ARE PRODUCTS MADE UP OF HYDROCARBONS AND MANY OTHER INGREDIENTS

What is a Oil, Grease, and Fuel?

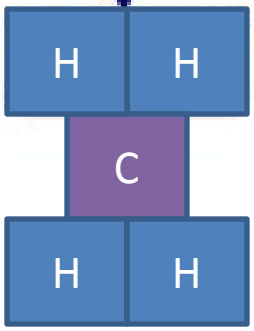
HYDROCARBONS →

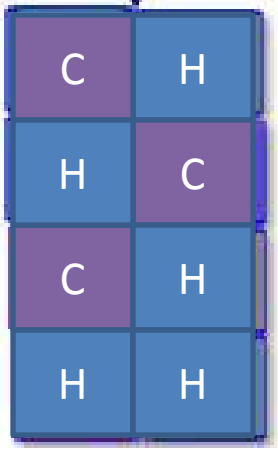


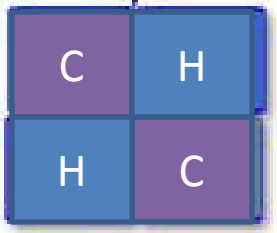




ELEMENTS →

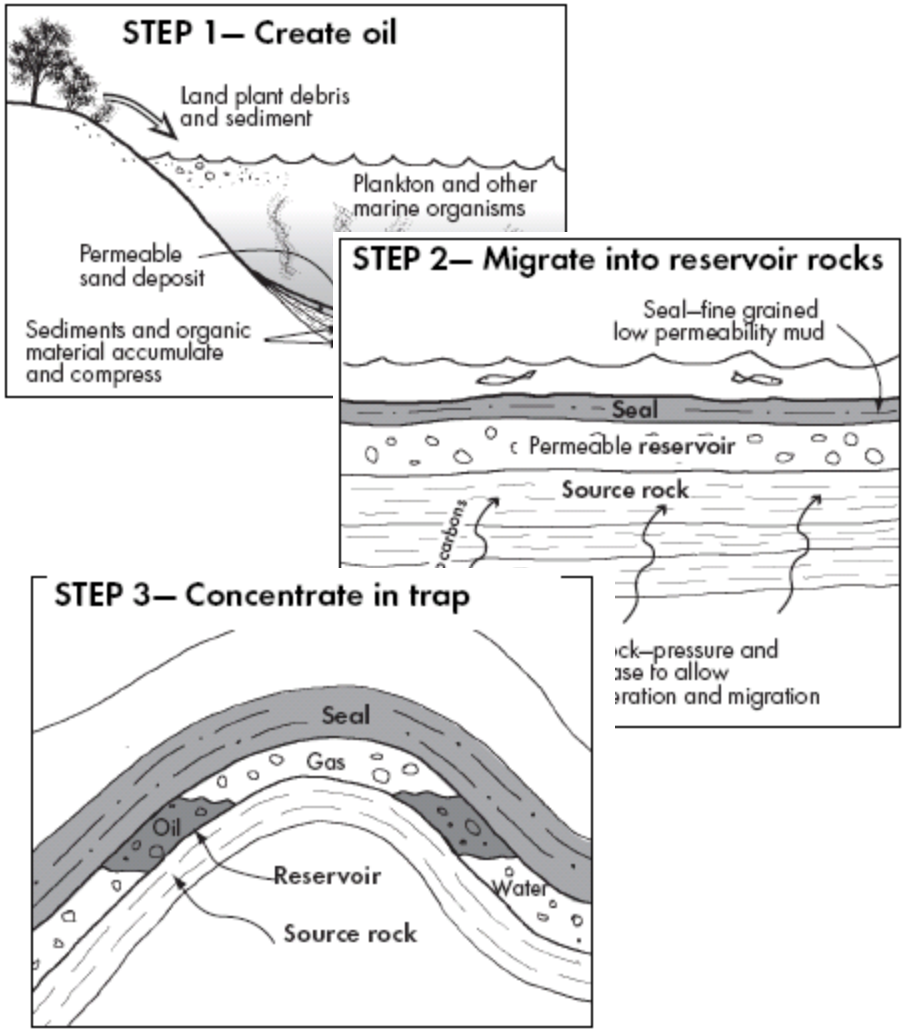






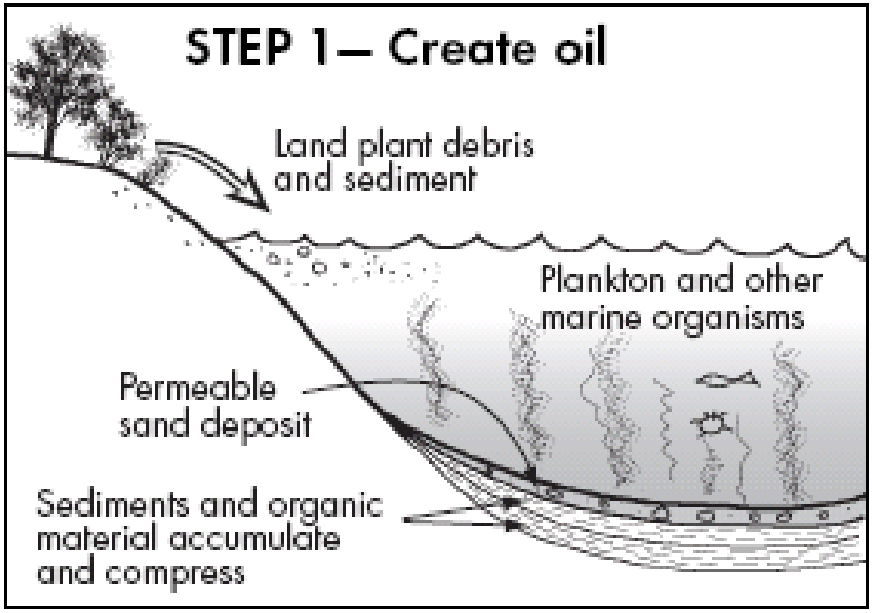
What are Fossil Fuels?

- Energy Sources that formed from the remains of once-living organisms
- Includes oil, coal and natural gas



What is Oil?

- Oil / Petroleum is a liquid hydrocarbon
- Originates from marine plants and animals that settled on the bottom of lakes, streams, oceans
- Sediments covered the organic material and “cooked” through pressure and heat



What is Grease?

- Semi-solid mixture of oil and a thickening agent (eg. A soap)
- Includes petroleum jellies like Vasoline

Regulation

Water Licences

- Oil and Grease
- Hydrocarbons
- BTEX
- PAH
- Oil based drilling muds

Land Use Permits

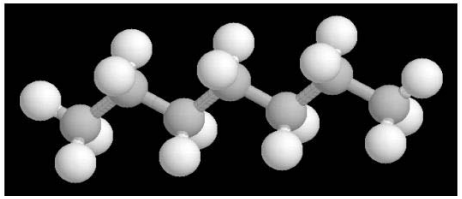
- Spill response / contingency
- Fuel storage and containment
- Sumps
- Reporting fuel quantities

Oil, Grease, Hydrocarbons, BTEX, PAH, Fuel

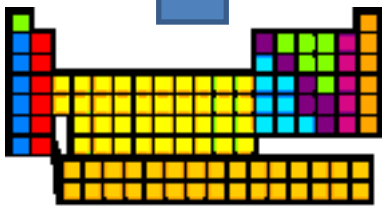
Oil, Grease, Hydrocarbons, BTEX, PAH, Fuel

HYDROCARBON PRODUCTS:
Oil, Grease, Fuel

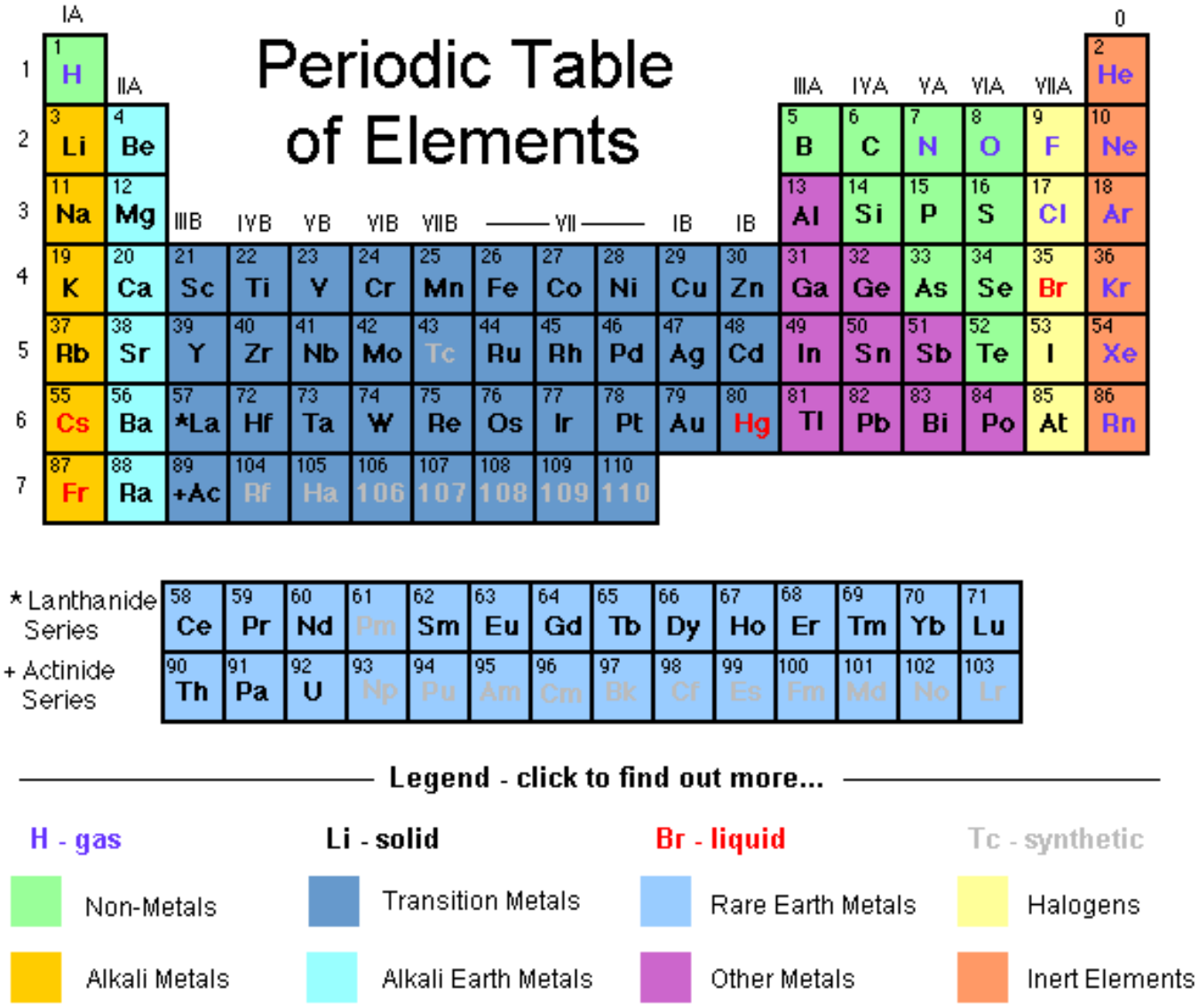
HYDROCARBONS:
BTEX, PAH
also: Alkanes, Alkenes, Alkynes, Cyclo-



CHEMICAL MIXURES:
Recipe & Shape



The Building Blocks



We need to start HERE

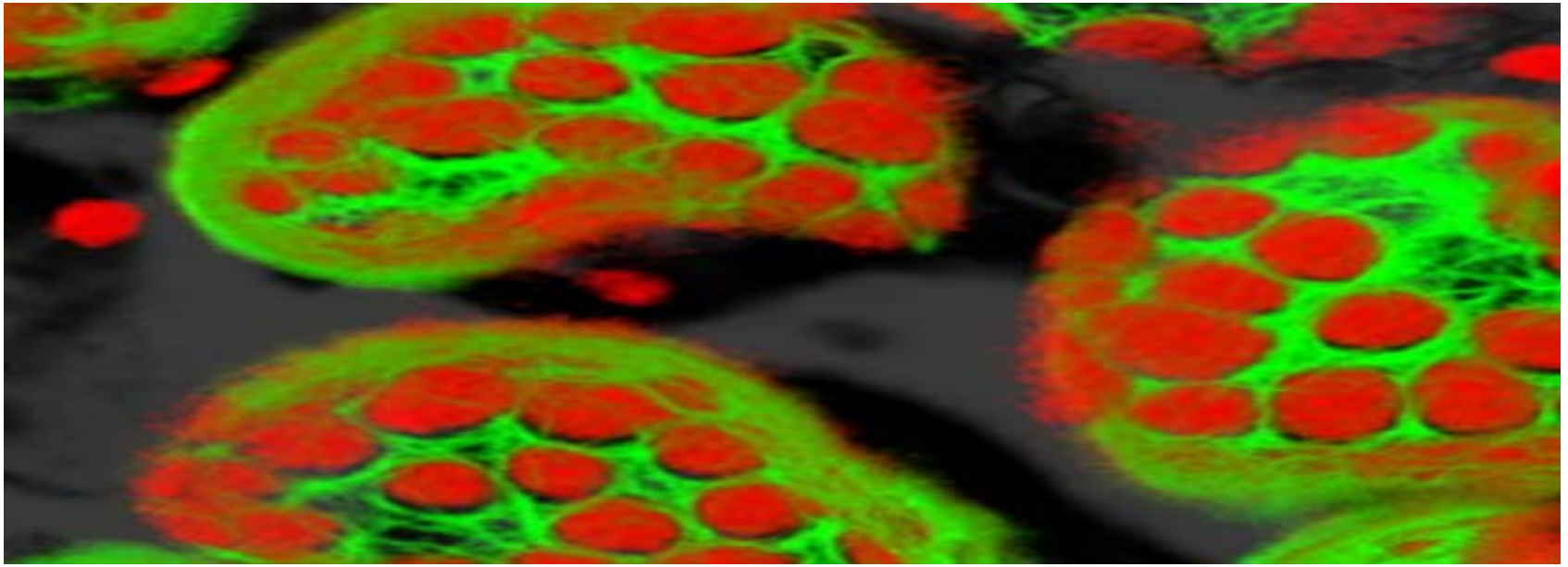
The Universe

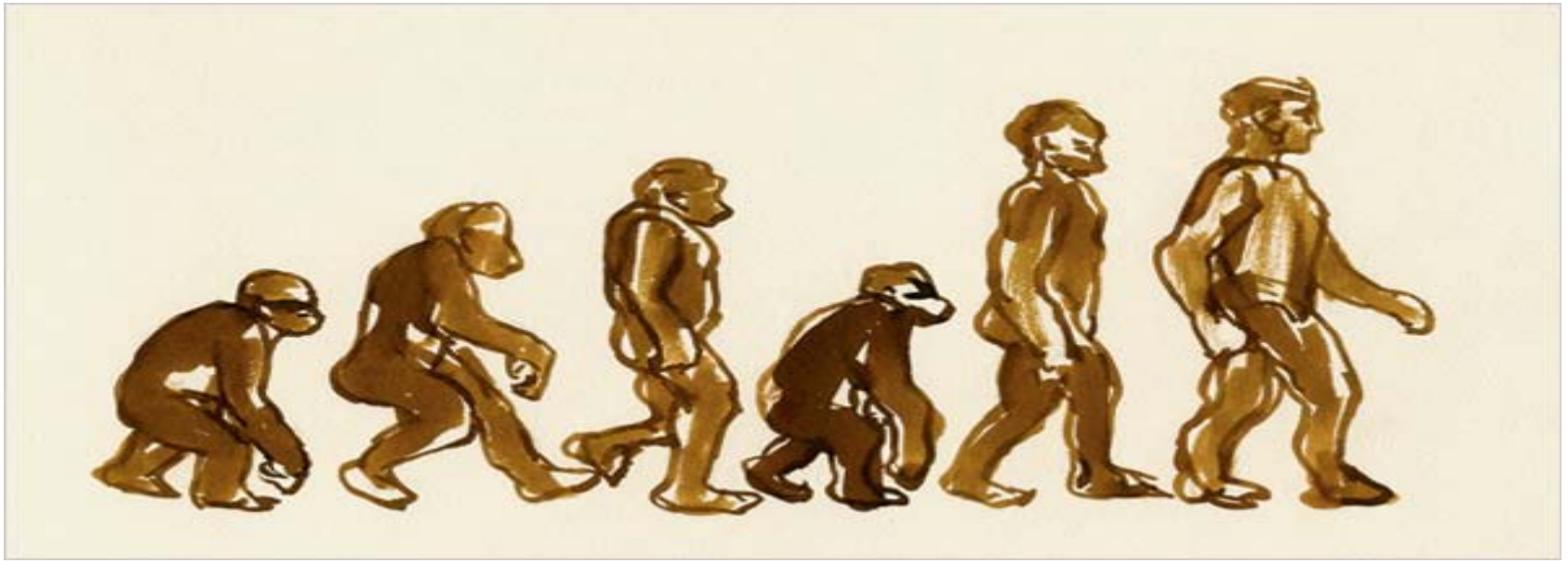
The Universe is made up of elements

Earth

Everything on earth is made up of elements

Life on Earth





Everything living is made of Carbon and Hydrogen Elements

Environment of formation

Hydrocarbon products formed by buried living matter in marine, lake, and swampy environments

The Rocks

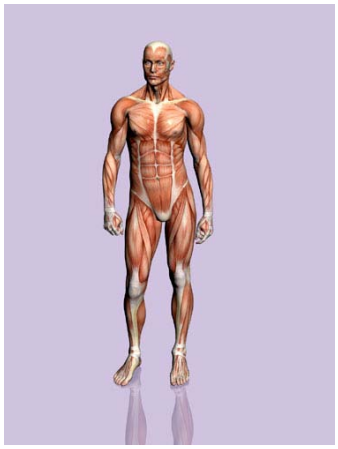
Hydrocarbons are trapped in rocks

Production

We explore for oil and gas to make hydrocarbon products

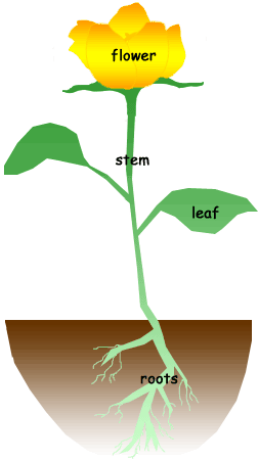
Why do we care?

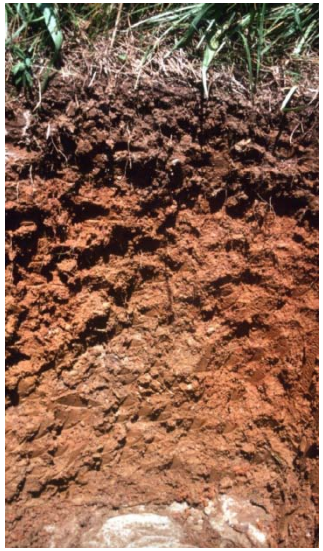
MODES OF TOXICITY



Types of Toxicity

- Acute (death)
- Chronic (sick)
- Carcinogenic
- Teratogen
- Respiration
- Inhibitor

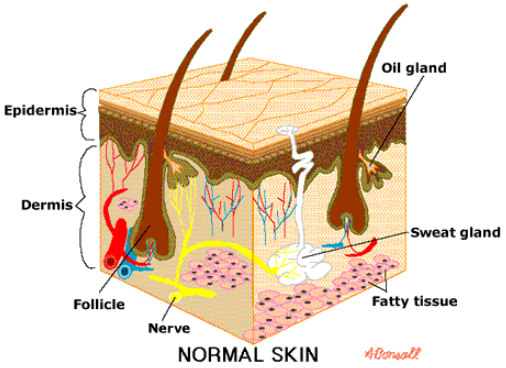




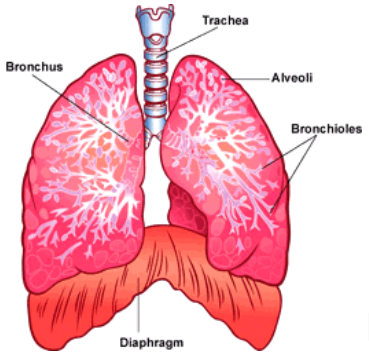
How Does it Happen?

Route of Toxicant Uptake

Toxicants normally have to penetrate through at least one layer of cells to affect organisms



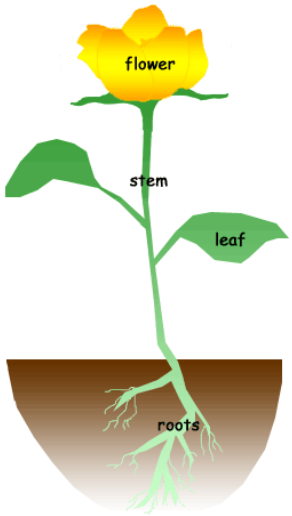
Skin



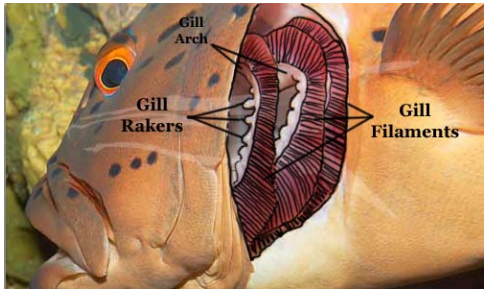
Lungs

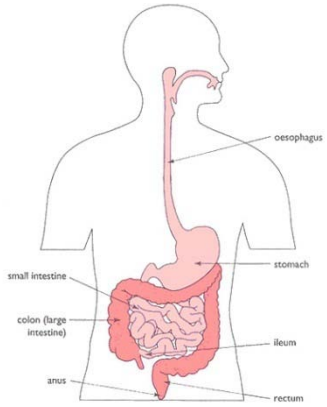
Leaves

Roots



Gills





Gastrointestinal Tract

Hydrocarbon Toxicity

- Asphyxiants
- Dermatitis
- Central nervous system depression
- Phytotoxic (toxic to plants)
- Death
- Carcinogen
- Kidney failure

What Should We Do?

HYDROCARBON MANAGEMENT

How do we treat?

How do we minimize?

How do we prevent?

Prevent & Plan

- Best Practices (double wall tanks, drip pans)
- Hydrocarbon Management Plan
- Choose alternate products
- Spill Contingency Plan
- Spill Kits

Minimize

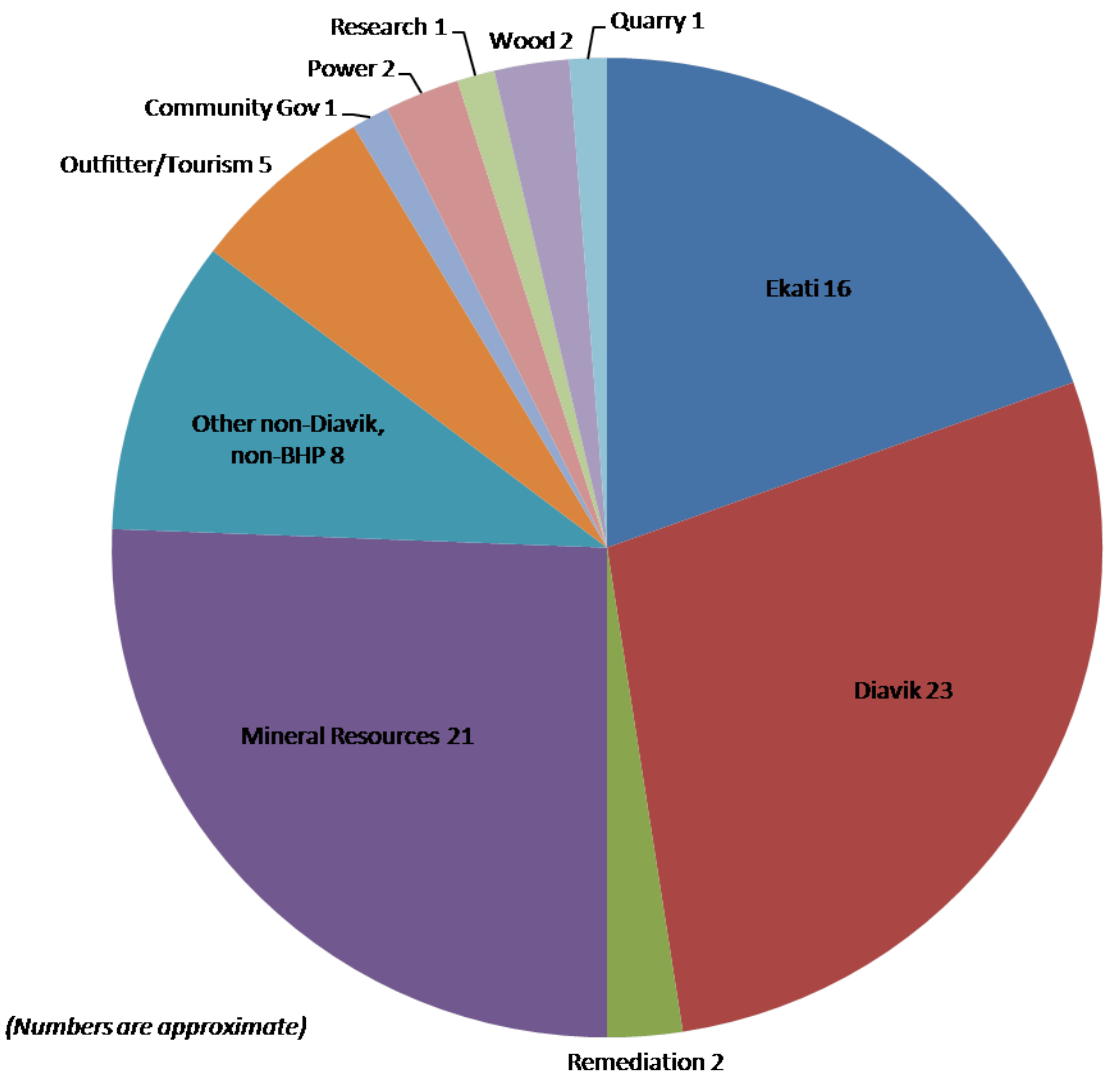
- Stop, contain, & collect spill
- Construct berms & trenches
- Skim “floating” hydrocarbons from water

Treat

- Land Farming
- Bio-Remediation
- Constructed Wetlands
- Oily Water Separator
- Disposal Cell (Tailings)
- Burn
- Ship it South

We regulate to prevent, plan, minimize, and treat

We regulate mining, exploration, drilling, reclamation, power, and sewage disposal activities



HYDROCARBONS

WHAT DO YOU THINK OF NOW WHEN YOU HEAR THIS WORD?

HYDROCARBONS

QUESTIONS?