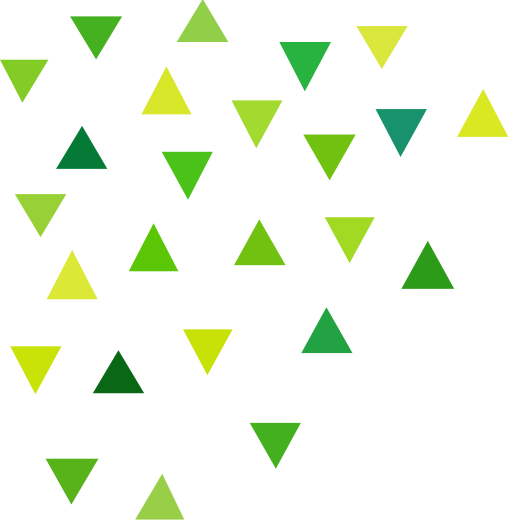
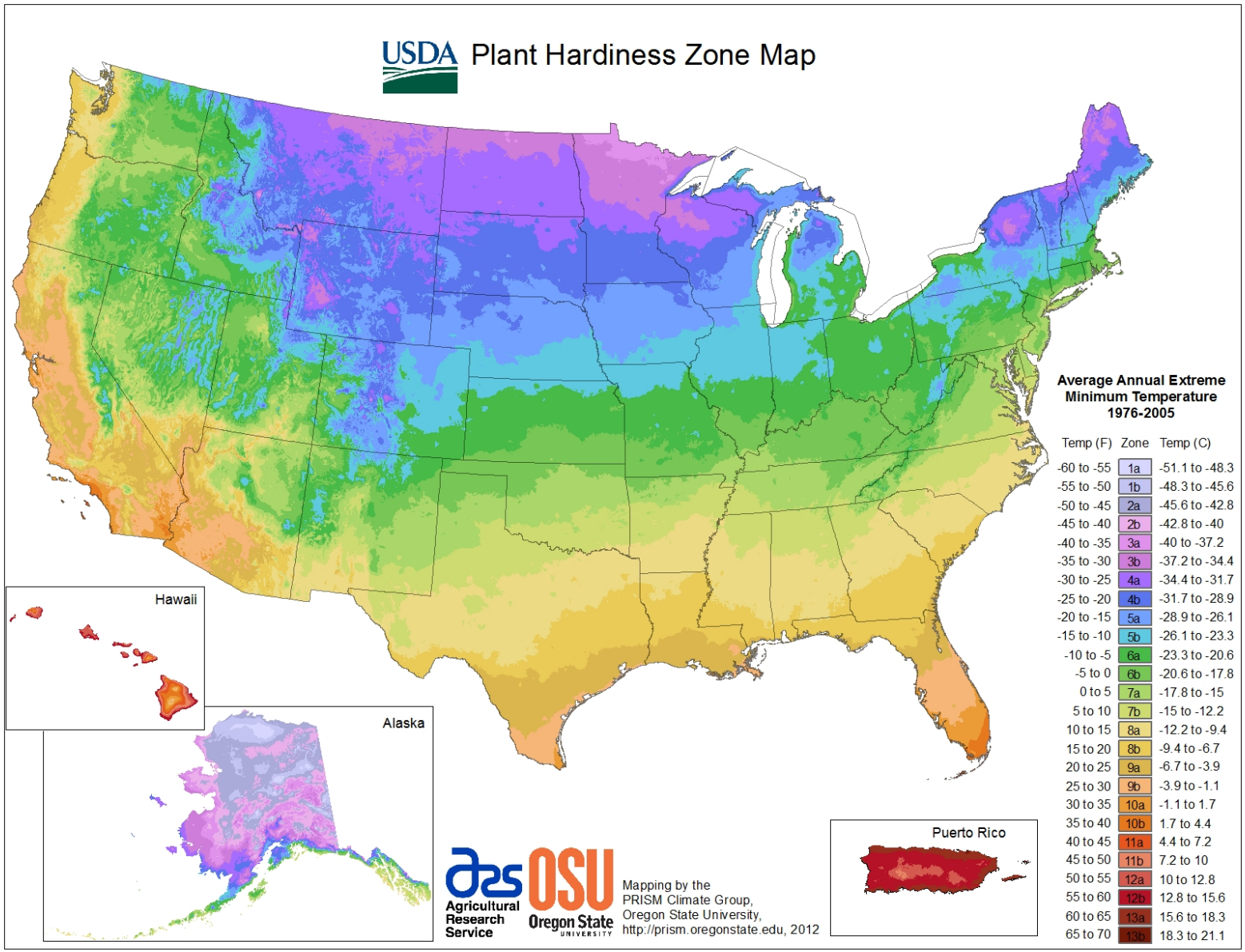


Cannabis Data Science #64

May 4th, 2022

Plant Hardiness



Fertilizers

Fertilizer-burn on a cannabis leaf.

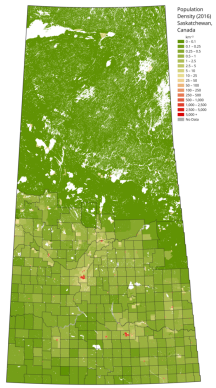
Why is so much fertilizer used?
Vital elements for plant growth:

- **N** Nitrogen
- **P** Phosphorus
- **K** Potassium

(K) Potassium Fertilizers

- The third major plant and crop nutrient.
- Dissolves readily in water → quickly available for plant nutrition.
- Improves water retention, yield, nutrient value, taste, color, texture and disease resistance of food crops.
- The growth of many plants is limited by potassium availability.
- No substitutes exist for potassium as an essential plant nutrient. (**inelastic demand**)!)

K Potassium chloride (KCl).



Population density map of Saskatchewan, Canada. (2016)

(P) Phosphorus Fertilizers

- Produced when ammonia reacts with phosphoric acid.
- Temporarily increases the soil pH. Over the long term the treated ground becomes more acidic.

Industrial fertilizer plant producing ammonia (UK, 2006).

(N) Nitrogen fertilizers

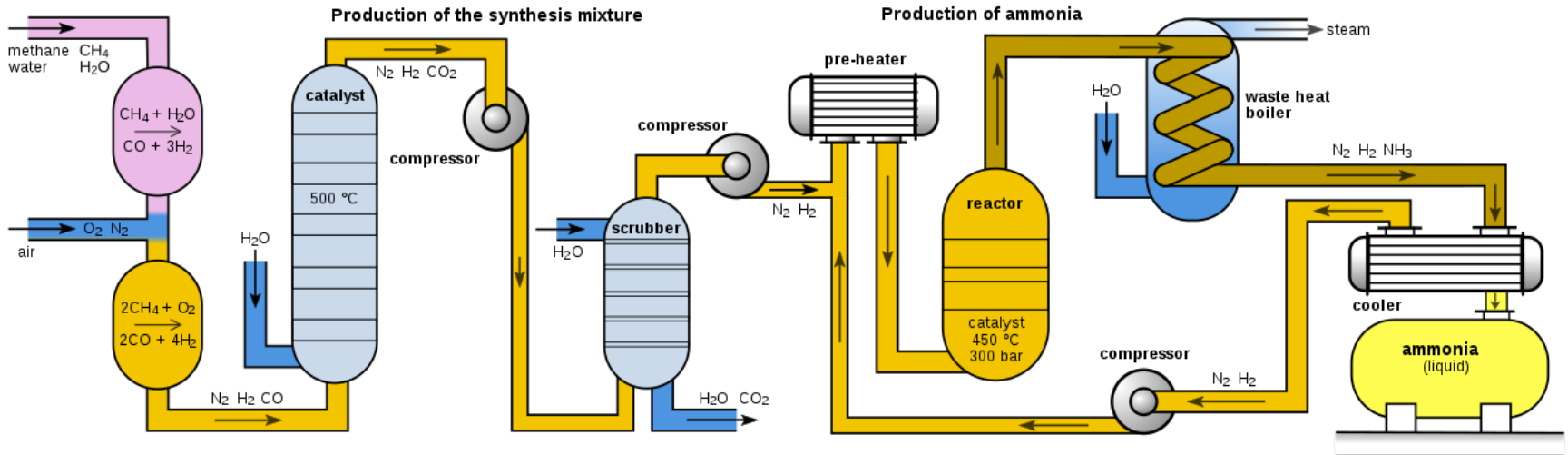
Fritz Haber demonstrated the process of producing ammonia from air, drop by drop, at the rate of about 125 mL (4 US fl oz) per hour. (1909)

$$N_2 + 3H_2 \rightarrow 2NH_3$$

Fritz Haber, 1918

Nitrogen Fertilizers Today

- Modern ammonia plants produce more than 3,000 tons per day.
- Natural gas is the major source of hydrogen, via methane.



Haber–Bosch process.

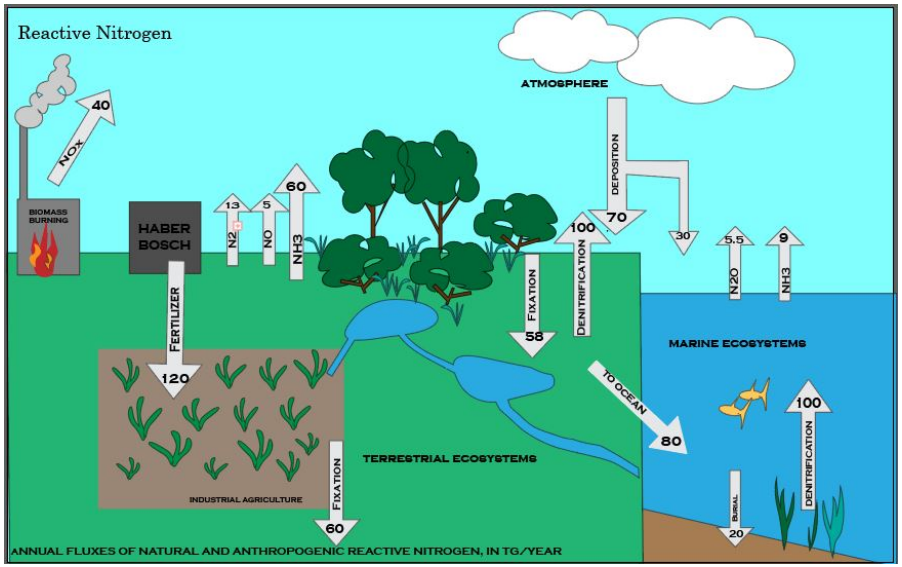
Fertilizers in the Ecosystem

Benefit – An estimated 30 to 50% of crop yields are attributed to natural or synthetic fertilizers.

Benefit – Perhaps the reason that the global population could increase from 1.6 billion in 1900 to 7.7 billion by November 2018.

Concern – Nitrogen use efficiency is typically less than 50%.

Concern – Runoff from industrial use can be a concern.



Global cycling of reactive nitrogen.

Risks of Fertilizers

Runoff at a farm in Iowa.

Author: Lynn Betts, U.S. Department of Agriculture

- Steel industry wastes may be recycled into fertilizers for their high levels of zinc (essential to plant growth) and can include the following toxic metals:
  - Lead
  - Arsenic
  - Cadmium
  - Chromium

Data of the costs of cannabis cultivation

 **Thank you for coming.**

Insight of the Day

- Follow the money. 

What is on your mind for next week?