



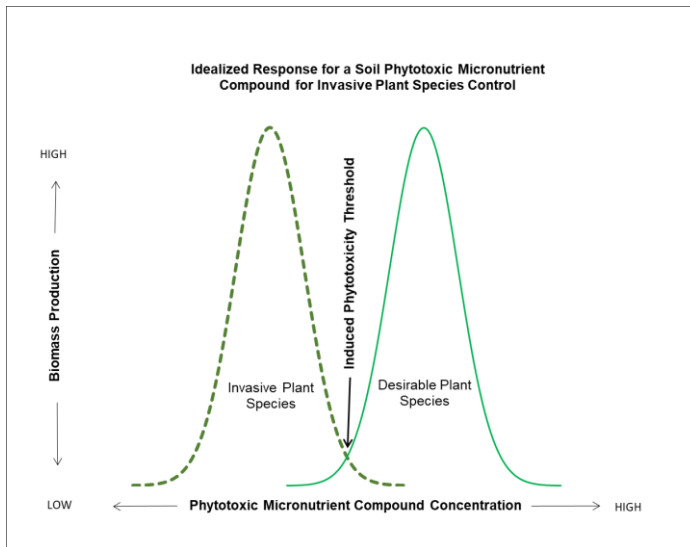
*Imagine a World where Fertilizers Create  
Healthy Soils and Prevent Weed Invasion!*



# What is Edaphix™?

## The Technology

- Fertilizer-based vegetation management technology emphasizing soil health through micronutrient supplementation (Cu, Zn, Fe, B, Mo and Mn)



## Origin of Edaphix™

- Mines, smelters and power plants provided unique environmental laboratories for studying elevated soil micronutrient levels and their effects on plants
- Discovery that micronutrient fertilizers could be formulated to promote growth of desirable species allowing them to outcompete invasive weeds
- First US Patent issued Sept 2014
- Edaphix founded January 2017
- Company named from the Greek word 'edaphic' or 'derived from the soil'

US Patent No. 8,835,355 (Sept 2014)



# The Edaphix Opportunity

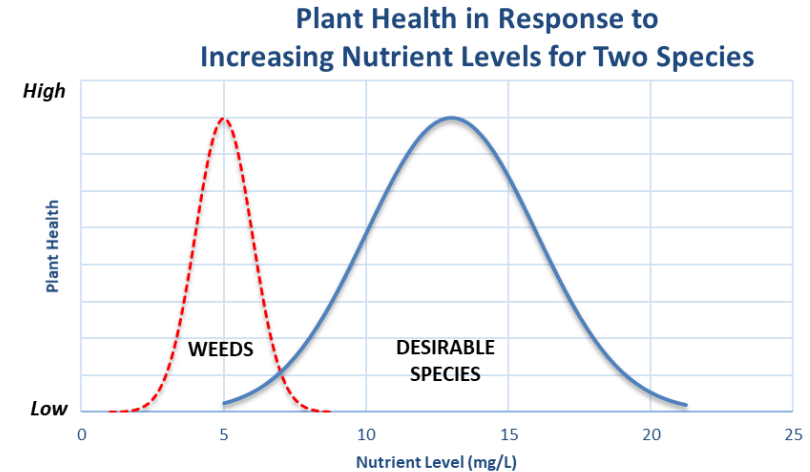


## ***We Can Fix Degraded Soil through***

***Fertilization:*** Plants respond to nutrient availability, sunlight, temperature and water availability. We can't control climate but we can control fertility. Unconventional fertilizer formulations low in nitrogen replace essential plant nutrients and provide the basic building blocks for grassland restoration.



Stressed dandelion leaves growing in healthy turf grass.



Soils deficient in nutrients are susceptible to invasion by weeds. Higher levels of fertility, and especially micronutrient fertility, lead to improved growth of late successional desirable species at the expense of early successional invaders.



# Why does the World Need This?

## Now

- Grassland Restoration
- Reclamation
  - Improved stormwater management
  - Native plant revegetation
  - Permit compliance
- Wildfire Reduction
  - Perennial plants stay green later in the season and are less combustible
- Endangered Species
  - Sage grouse and others
- Expanding Consumer Preferences for Non-synthetic and Organic Products for Vegetation Management
- Improved Forage Quantity and Quality on Grazing Land

## The Future

- Sustainable Agriculture
  - Nutrient dense food
  - Avoidance of petrochemical N
- Healthy Food
  - Reduced herbicide residues
  - Enhanced mineral nutrients
- Carbon Sequestration in Soil
  - A Global challenge. Soil is the preferred reservoir and perennial grasses are the key.
- Cancer
  - 1 in 2 lifetime risk (men), 1 in 3 lifetime risk (women)
  - Herbicides and pesticides are a carcinogenic concern



# How does it work?

- Fertilizer is applied to the soil in unconventional formulations to create geochemical soil conditions suited to desirable late successional grassland plants.
- Fertilizer can be applied as a liquid for fast root uptake or to the soil as a granular product for slow-release.
- Restores soil health by providing nutrients to stimulate growth of desirable perennial species (commonly grasses as shown by the green leaf tissue in the image)
- Easy to apply
- Our Focus: Rangeland, Turf and Noxious Weeds and the Soil Conditions leading to their Proliferation

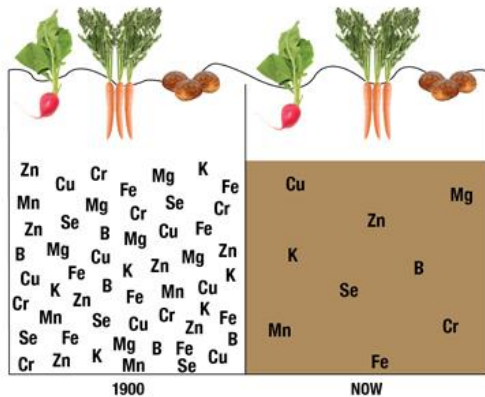




# Food for Thought: at the same time food became depleted in minerals the prevalence of weeds spiraled out of control. Could these issues be related?




**Plants may look the same, but they now have far fewer minerals.**



## 70 YEARS OF SOIL DEPLETION

The reduction in average mineral content of fruits and vegetables since 1940.<sup>†</sup>

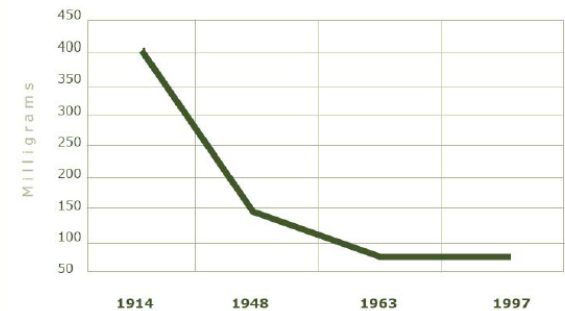


MINERAL	VEGETABLES	FRUITS
Sodium	-49%	-29%
Potassium	-16%	-19%
Magnesium	-24%	-16%
Calcium	-46%	-16%
Iron	-27%	-24%
Copper	-76%	-20%
Zinc	-59%	-27%



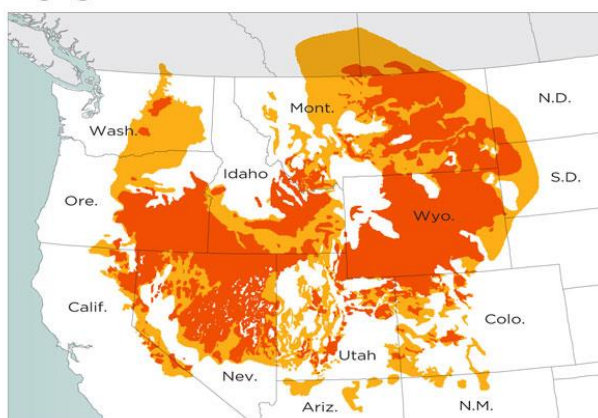
### Average Mineral Content In Selected Vegetables, 1914 -1997

Sums of averages of calcium, magnesium and iron in cabbage, lettuce, tomatoes and spinach



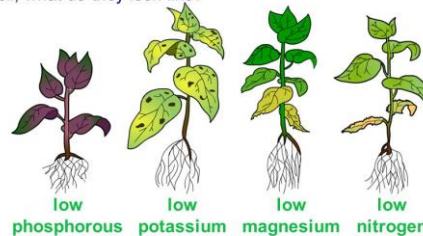
Source: Lindahl, 1914; Hamaker, 1982; U.S. Department of Agriculture, 1963 and 1997

### Sage grouse habitat

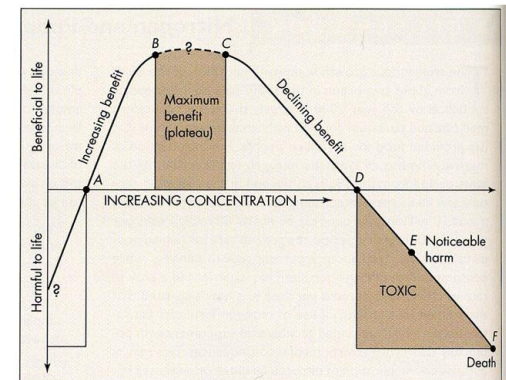


### Healthy plant growth

What happens when plants use up all the minerals in the soil, what do they look like?



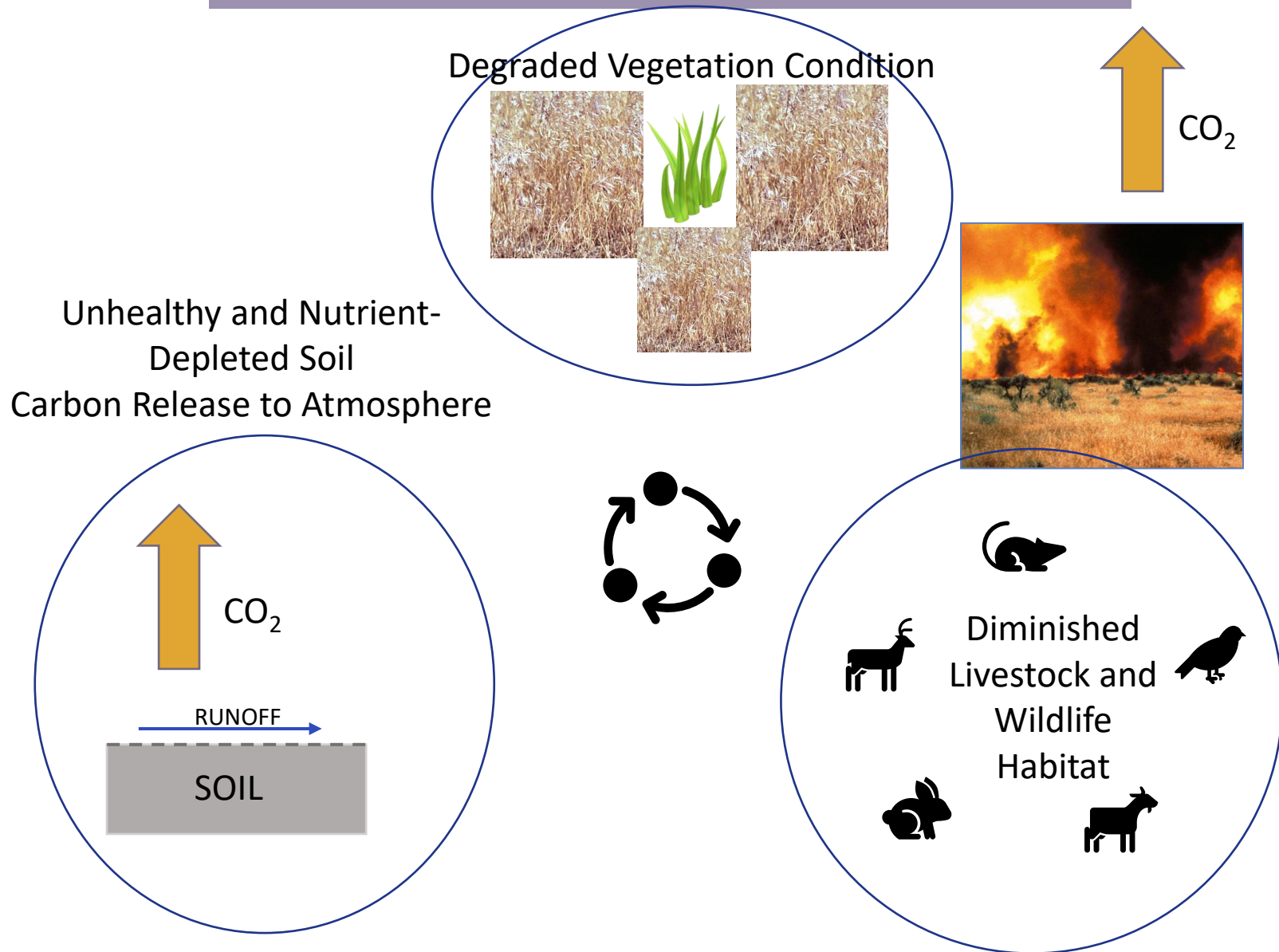
Can you explain why potted plants often look sickly?



Generalized dose-response curve; some metals are essential (beneficial or even necessary for life) in a certain concentration range (B -C), but are toxic when a certain threshold (D) is exceeded. Below threshold A for essential elements, deficiency also causes harm.



# Rangeland: What We've Got



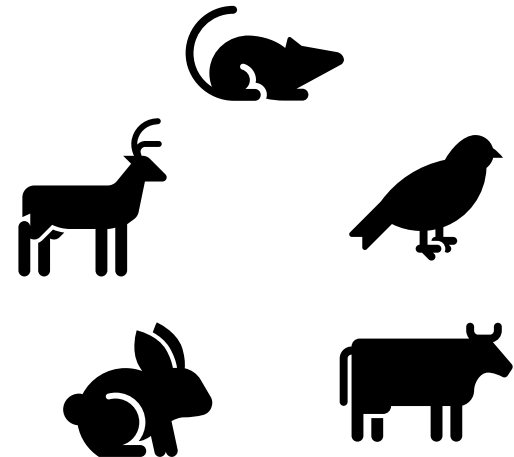
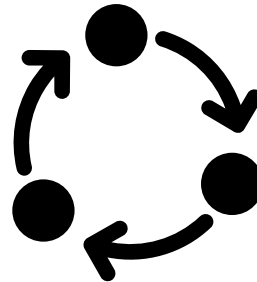
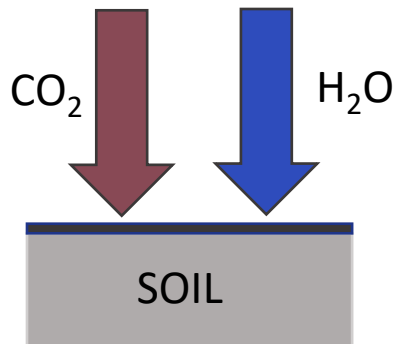


# Rangeland: What We Want



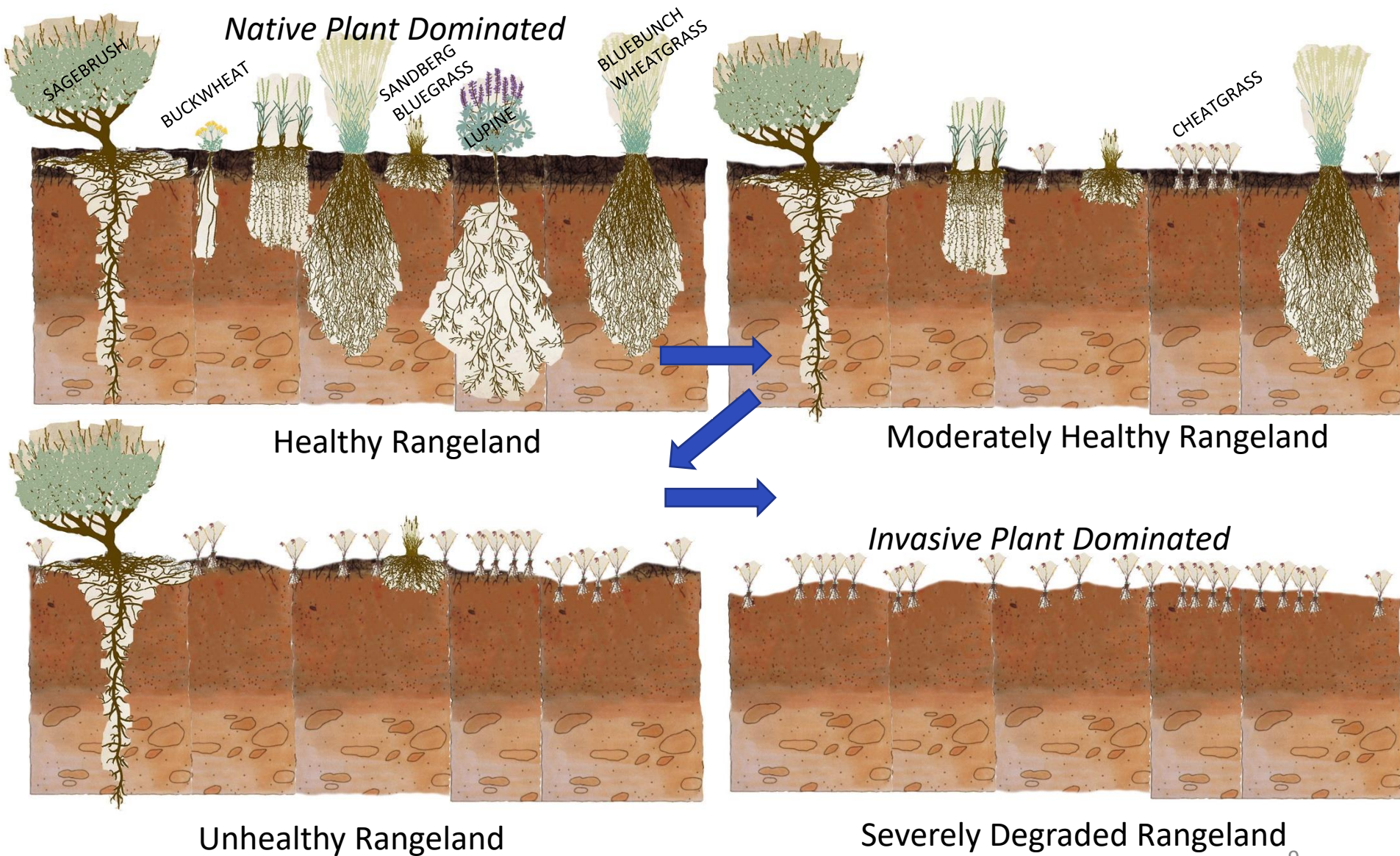
Perennial Plant Dominated  
Diverse Species  
High Productivity  
Fire Resistant  
Nutrient Dense Forage

Organic Matter Accumulation  
Plant Available and Nutrient-Rich Soil  
Structure that Promotes Infiltration



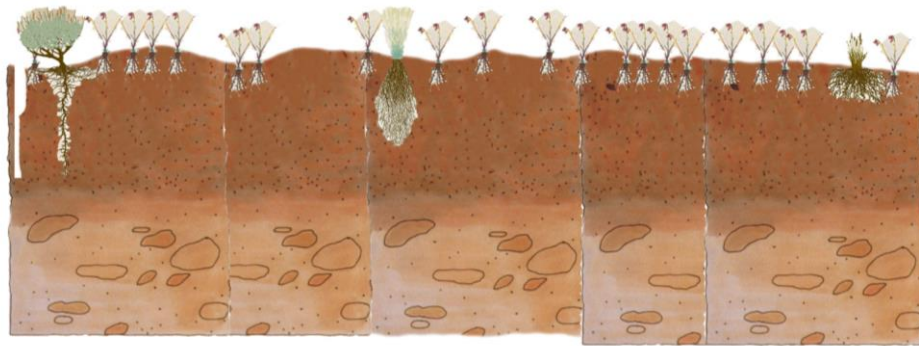


# Rangeland Cheatgrass Progression and Related Decline in Soil Quality: We Have Inadvertently Created Soil Conditions Well Suited to Cheatgrass Growth

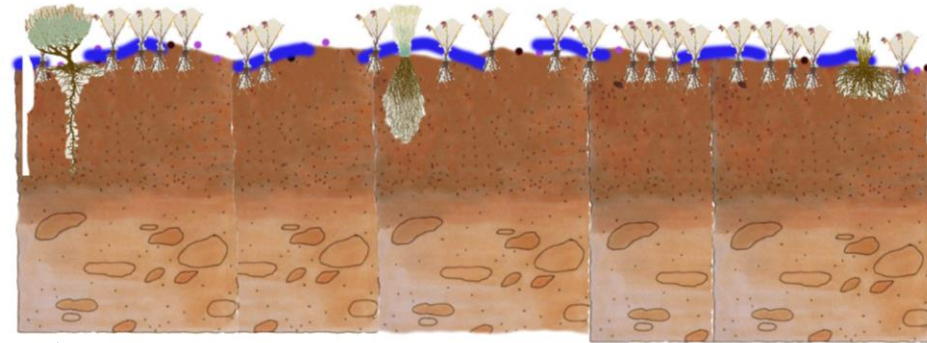




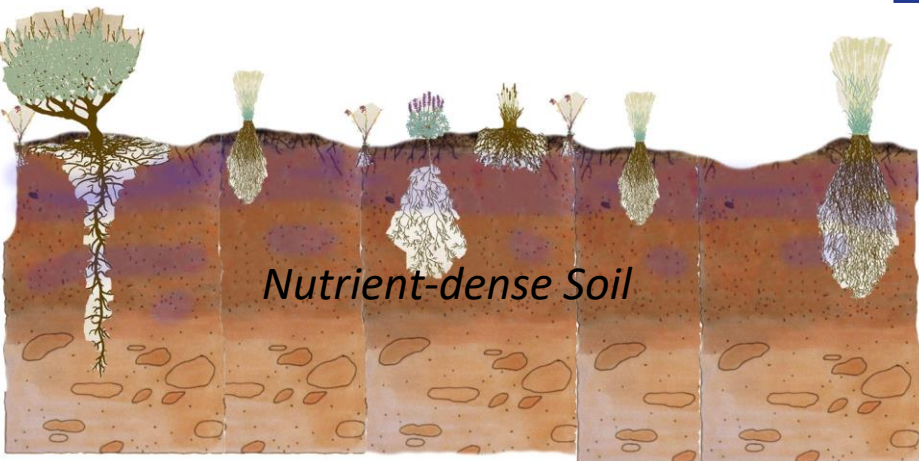
# How can we Revitalize Degraded Rangelands?



Severely Degraded Rangeland



Fertilizer Applied



*Nutrient-dense Soil*

Improved Soil with Increasing  
Perennial Plant Cover

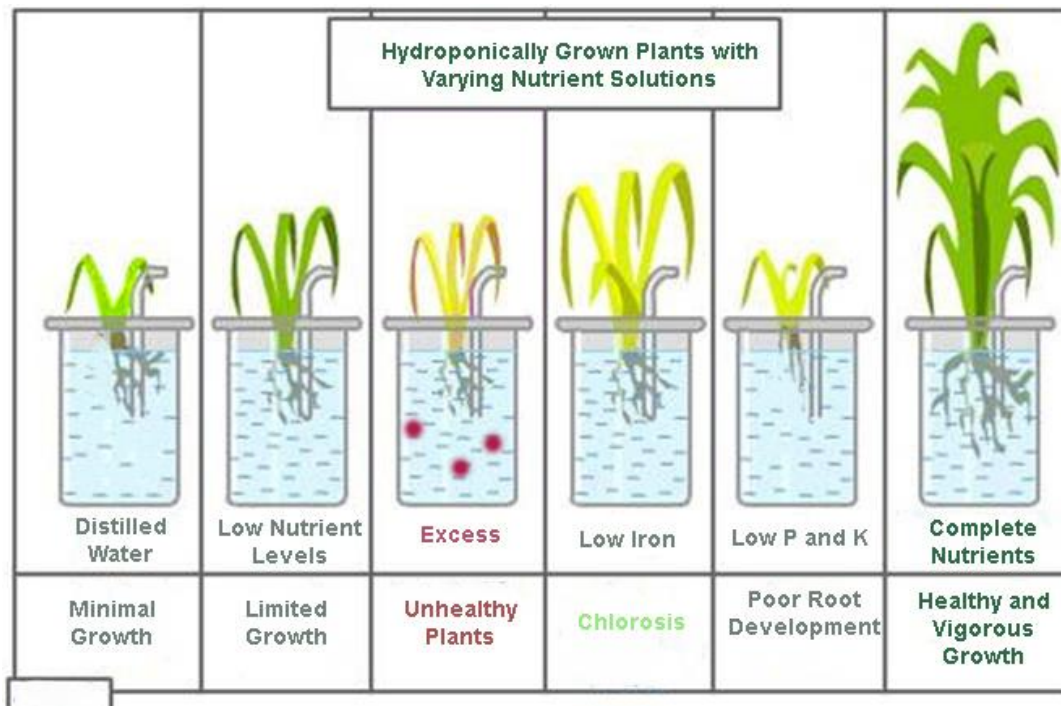


Healthy Rangeland



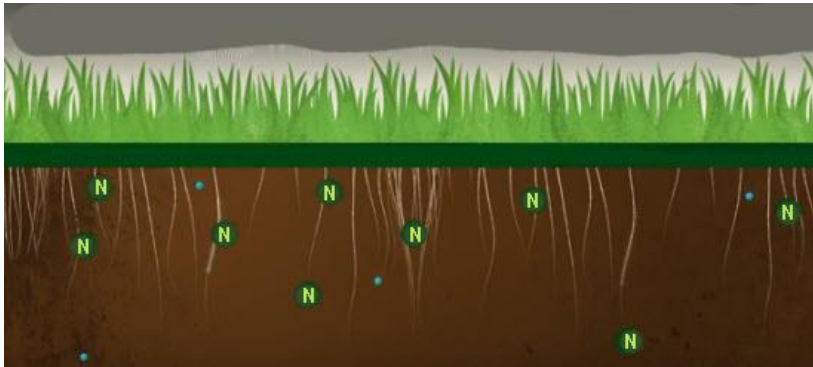


Plants take up nutrients through their roots or from the 'soil solution' much like hydroponically grown plants. Plant health and vigor is strongly controlled by nutrients in the soil solution.

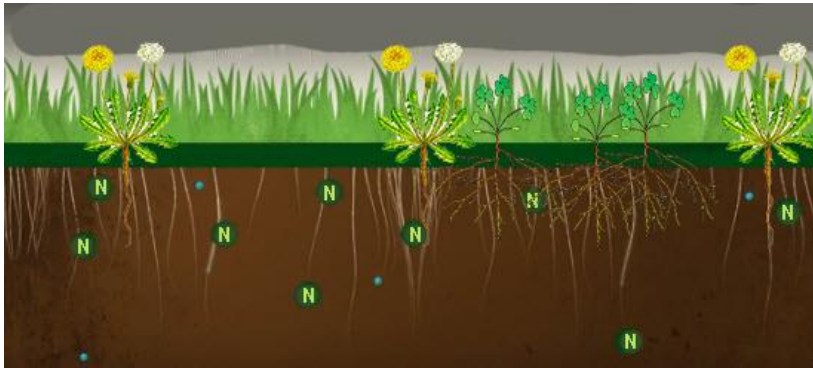




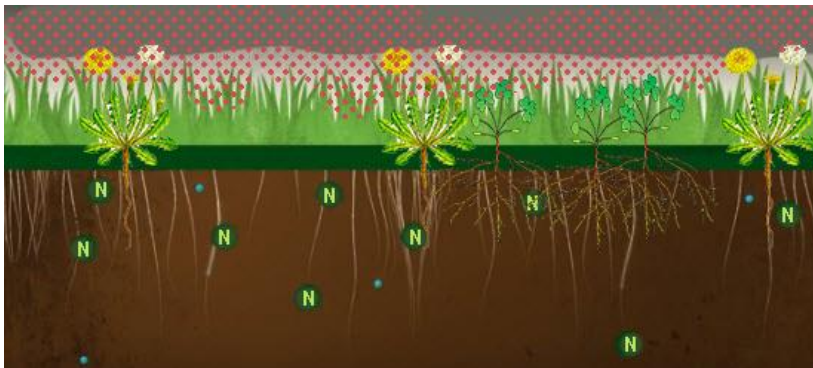
# Typical Turf Grass Management



Idealized turf grass growth occurs where nitrogen-rich soil supports the growth of dense, sod-forming turf grasses



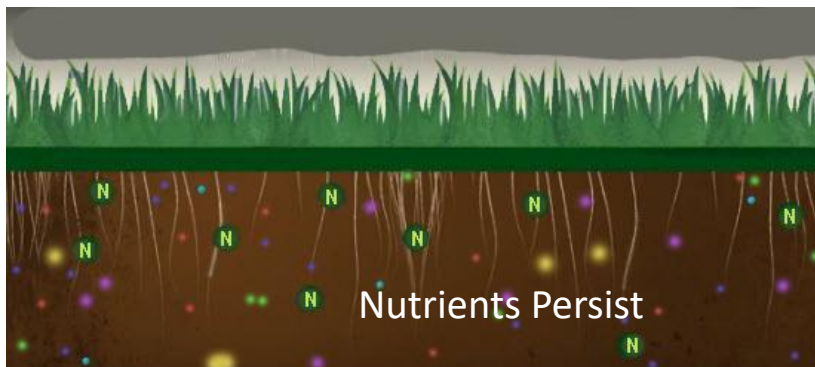
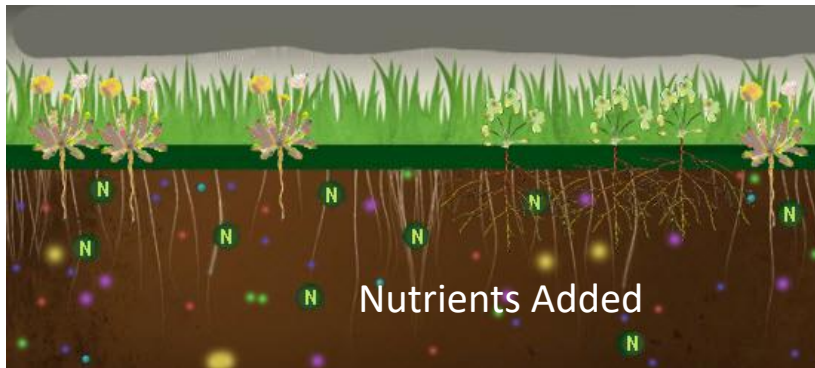
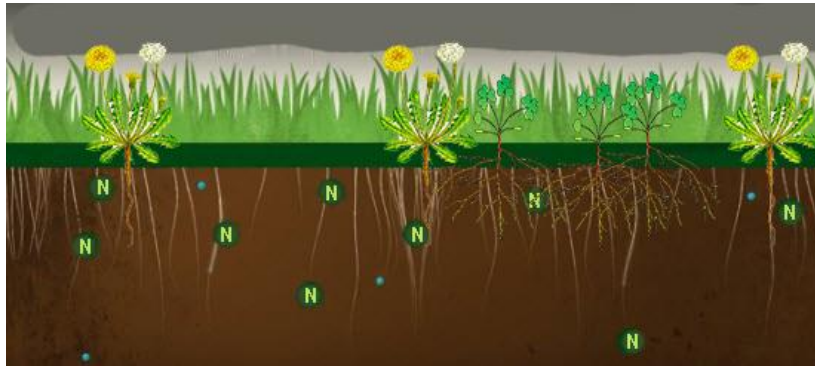
Unfortunately, dandelions and clover also thrive in the same soil conditions



Our societal answer to turf weeds has been to defoliate them with petrochemicals such as 2-4D herbicide. But isn't herbicide only treating the symptom of unhealthy soil?



# Unconventional Turf Grass Management



What if there was an alternative to herbicides where you changed the nutrient status of the soil to a condition that was beneficial to the turfgrass allowing it to outcompete the weeds?



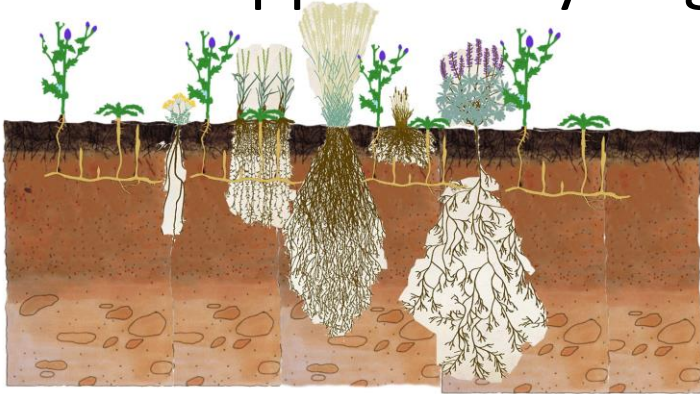
Apply Edaphix fertilizer. Nutrient-dense soil allows for natural allelopathic and competitive processes to occur where the invasive plants experience nutrient conditions unsuitable to their growth.

Turf grasses thrive in nutrient-dense soil and new invading weed seeds struggle to establish. In addition to nitrogen, turf grasses need complete nutrition including phosphorous, potassium, iron, manganese, sulfur, calcium, boron, copper, zinc and molybdenum.



# How about noxious weeds?

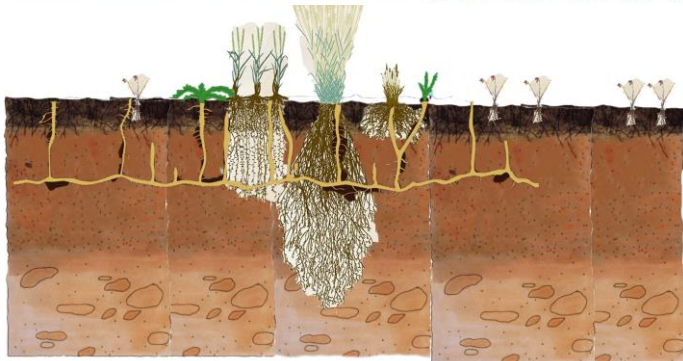
## Suppose they're growing in a native grassland.



Canadian thistle is a prevalent weed with a huge root system. Conventional herbicides may defoliate the above ground leaf tissue, but commonly the plant regrows from root resources.



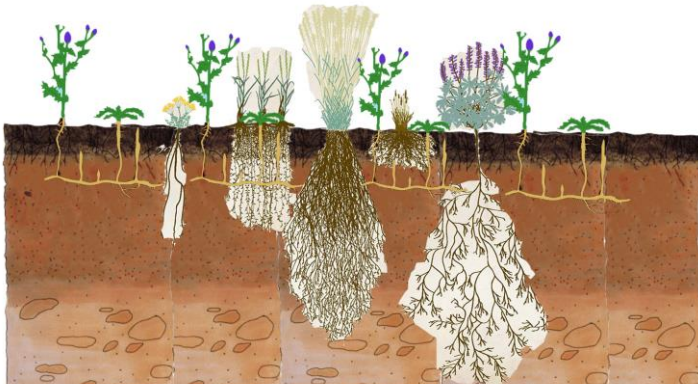
Herbicide applied. The big risk. What will happen now? Will the Canadian thistle be controlled? Will native forbs be harmed?



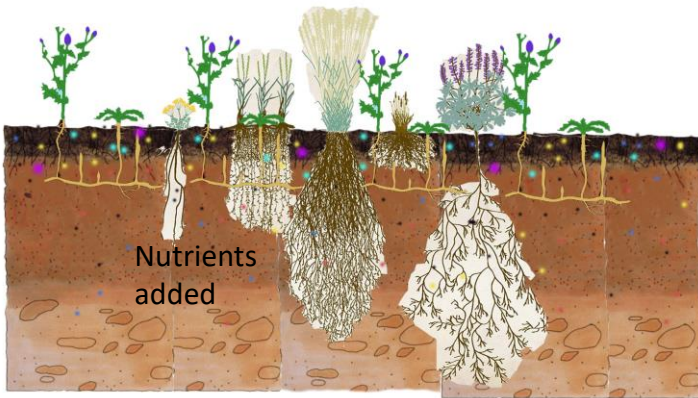
The herbicide was effective in defoliating the mature thistle, however not the roots. The result is thistle regrowth. The desirable native forbs were killed. Cheatgrass has established. The grassland is now worse than before. Isn't there a better way?



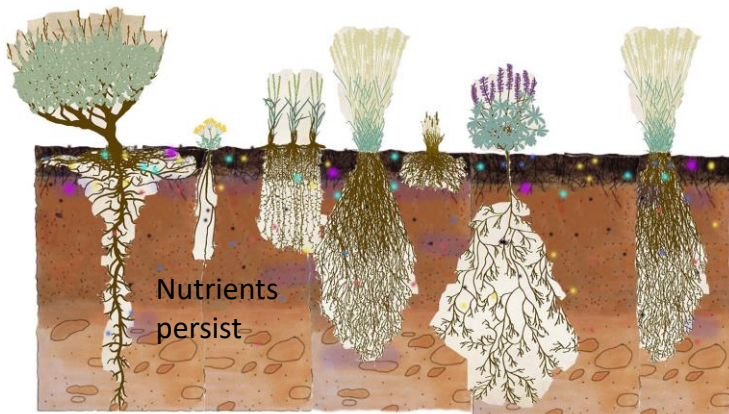
# Unconventional Noxious Weed Management



Canadian thistle is a prevalent weed with a huge root system. Herbicides may harm desirable forbs and lead to invasion of cheatgrass and other undesirable plants.



Apply Edaphix fertilizer. Nutrient-dense soil allows for natural allelopathic and competitive processes to occur where the invasive plants experience nutrient conditions unsuitable to their growth.



Native plants thrive and recolonize in nutrient-dense soil. Weed cover is diminished. Late successional soil nutrient conditions are reestablished including plant-available nitrogen, phosphorous, potassium, iron, manganese, sulfur, calcium, boron, copper, zinc and molybdenum.



# Our Approach

## Vision

- Healthy Soil
- Grassland Restoration
- Carbon Sequestration
- Forage and Food Quality
- Natural Mineral and Organic Feedstocks
- Sustainable Vegetation Management

## Outcomes

- Watershed, Wildland, and Working Land Restoration
- Soil Quality Improvement
- Healthy Turf
- Planet-Friendly Products
- Scientific Advancement
- Intellectual Property Development



# Choices

