

Dry Farming Techniques for Small Farm Resilience

A Women for the Land Learning Circle
March 2022, Brisa Ranch



What is dry farming? / ¿Qué es la agricultura de secano?

- Age-old technique / Técnica antigua
 - Hopi dry farming in AZ / indígenas en arizona
 - In CA, more closely resembles practices in Italy /
En CA, se parece más a las prácticas en Italia
- Relies on soil “water bank” recharged by winter rains /
Depende del “banco de agua” del suelo recargado por las lluvias invernales
- Suite of management practices involved / Diversas prácticas de gestión involucradas

Water inputs 

- Extremely limited /
Extremadamente limitada
- Typically 1-2 irrigation events for the whole season / Por lo general, 1 o 2 eventos de riego para toda la temporada

Fruit quality 

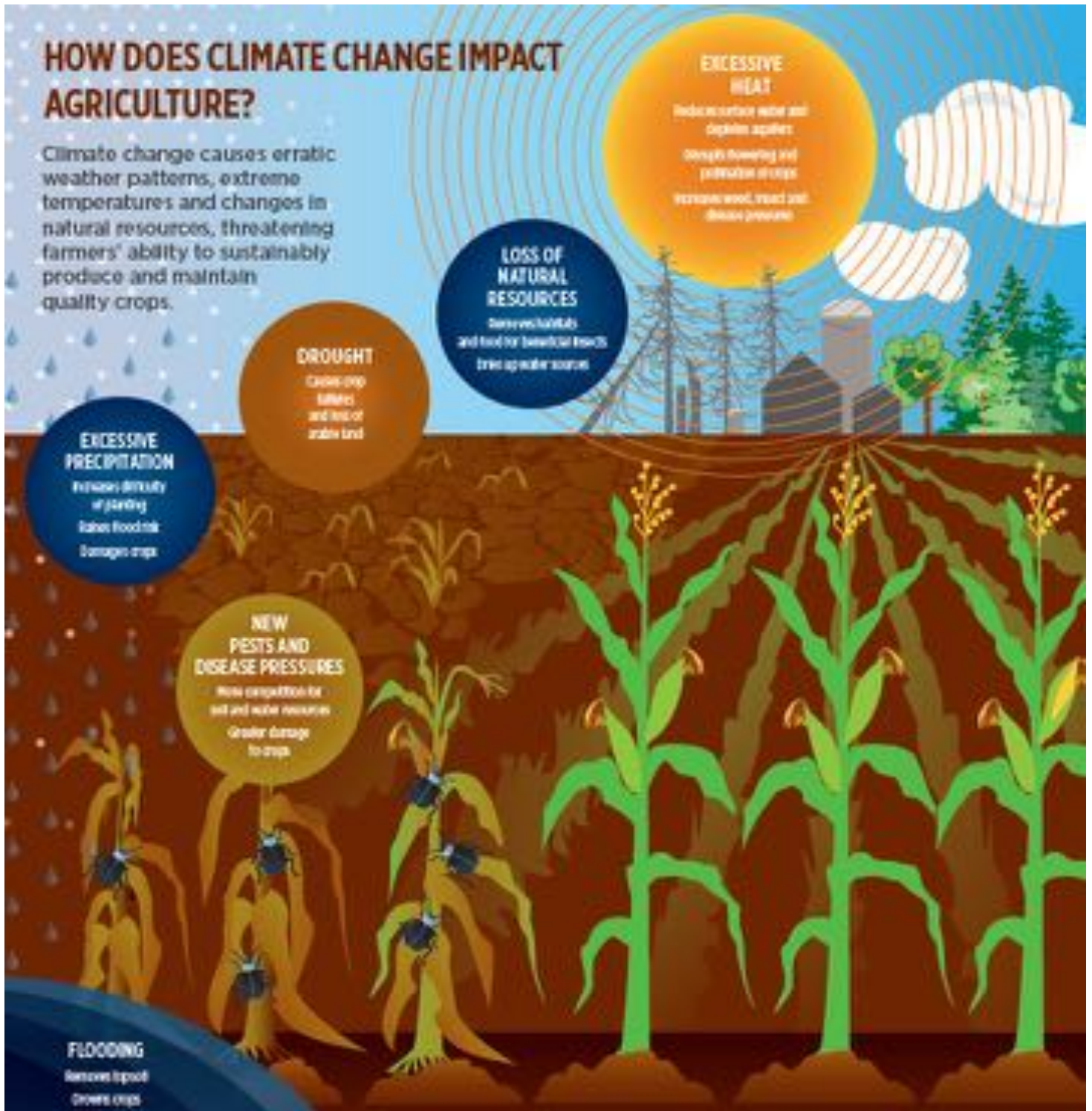
- Higher quality = higher price / Mayor calidad = precio más alto
- Sweeter, more flavorful / Más dulce, más sabrosa
- Lower water content
- Thicker skins

Potential crops (non-grain) / Cultivos potenciales

- Tried and true
 - Tomatoes
 - Early girl
 - New girl
 - Dirty girl
- Less common
 - Potatoes
 - Winter squash
- Potential other contenders
 - Dry beans

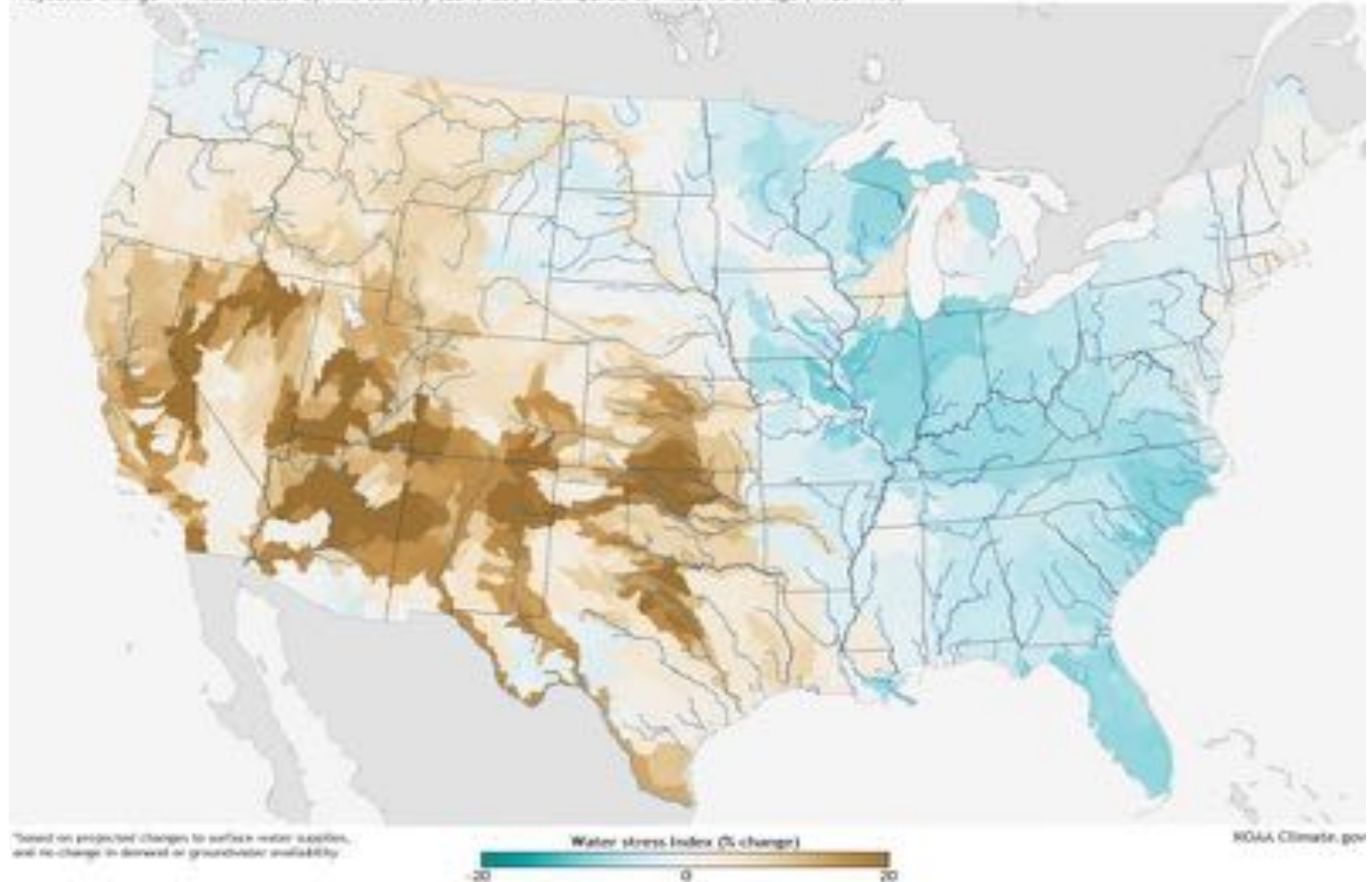


Climate Change Context / Contexto del Cambio Climático



Potential Economic Impacts on Agriculture / Impactos económicos en la agricultura

Projected change in water stress* by mid-century (2040-2061) compared to historic average (1900-1970)

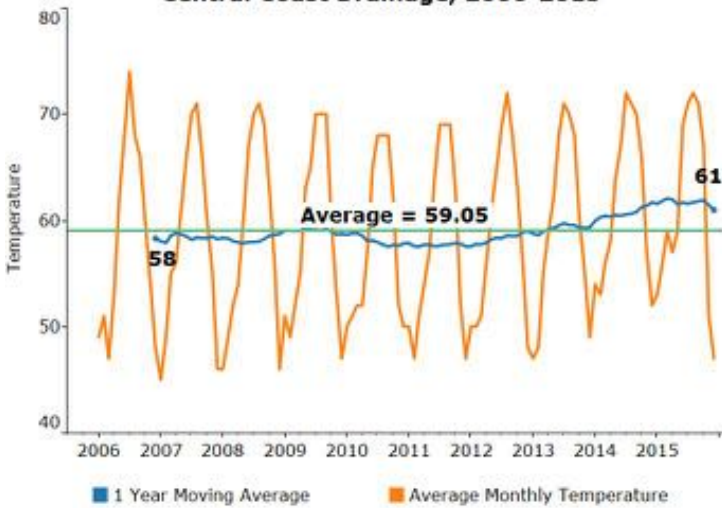


Increased Water Stress / Aumento del estrés hídrico

- \$\$ Declining yields
- \$\$ Changes to irrigation systems
- More & deeper wells \$\$
- \$\$ Lower water quality
- ?? Competing water use creates social and economic challenges \$\$

Observed Trends in the Central Coast CA

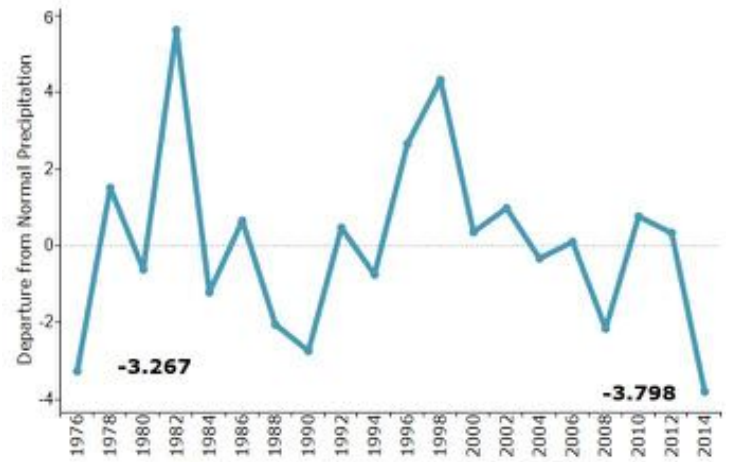
**Average Temperature
Central Coast Drainage, 2006-2015**



Data Source: National Oceanic and Atmospheric Administration, National Centers for Environmental Information, Climate Monitoring.

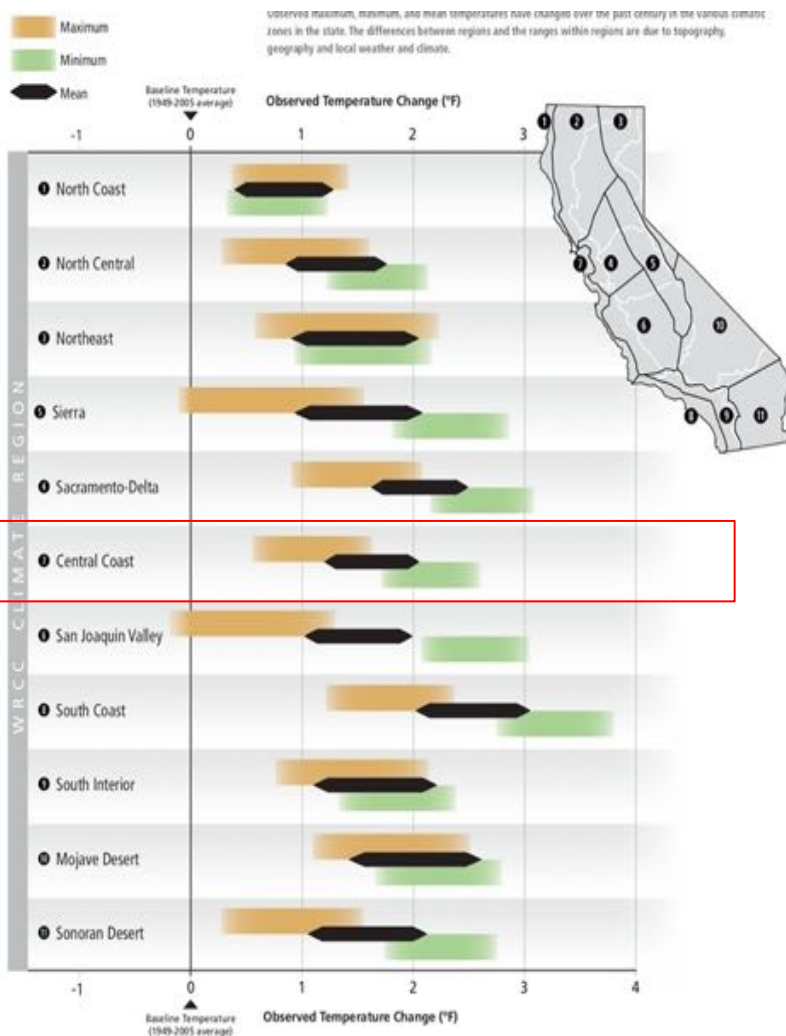
Sustainable San Mateo County

**Departure from Normal Precipitation,
San Mateo County, 1976-2014**



Data Source: National Oceanic and Atmospheric Administration, National Climatic Data Center.

Sustainable San Mateo County



- **Precipitation has lots of annual variability, but no trend / La precipitación tiene mucha variabilidad anual, pero ninguna tendencia**
- **Temperatures have been warming, with nighttime temperatures warming more than daytime temperatures / Las temperaturas se han estado calentando, con temperaturas nocturnas más cálidas que las temperaturas diurnas.**

Future Projections for the Central Coast / Proyecciones futuras para la costa central

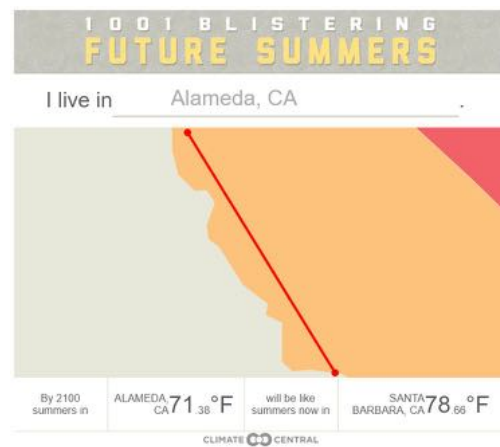
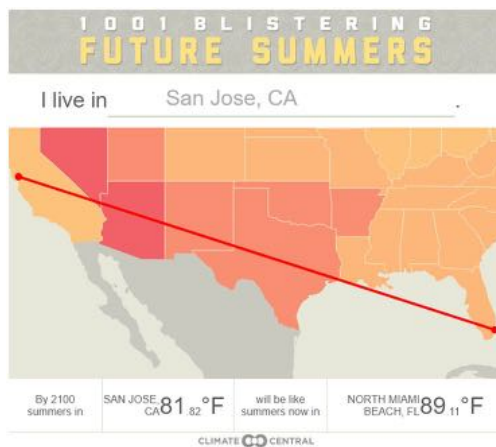
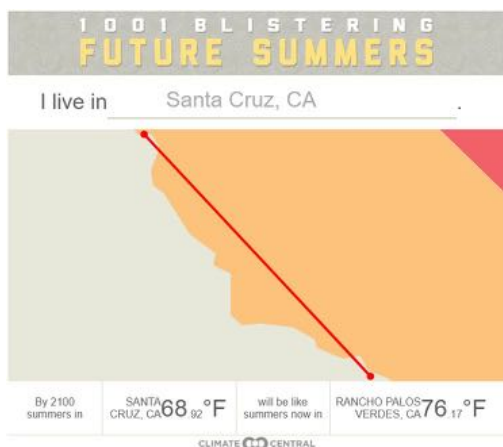
In future decades:

- **Precipitation will be highly variable** year-to-year
- Both maximum and minimum **temperatures will increase**
- **Average summer highs may be 7F warmer** in San Luis Obispo, Santa Barbara, & Ventura Counties by 2100
- **Extreme heat days could quintuple** by the 2060s

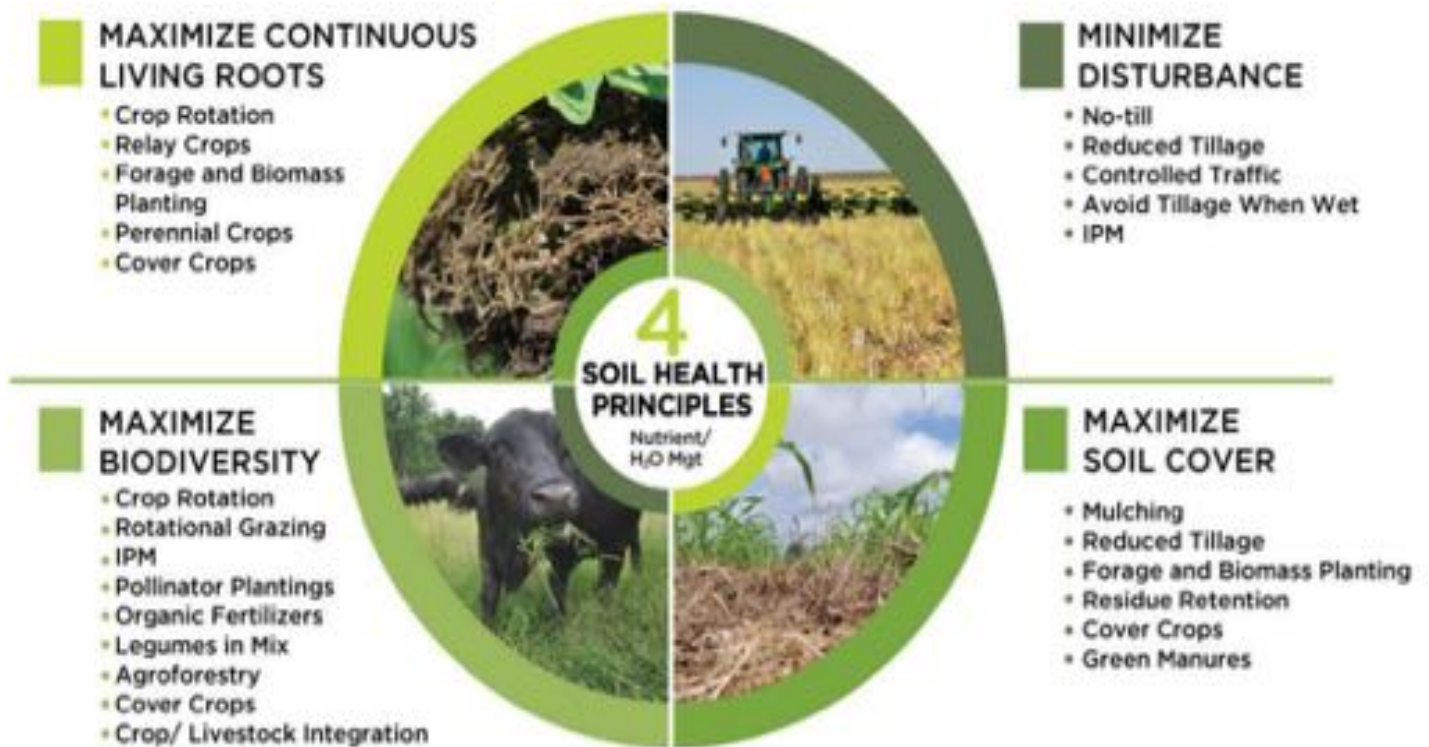
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En las próximas décadas:

- Las precipitaciones serán muy variables de un año a otro
- Aumentarán las temperaturas máximas y mínimas
- Los máximos promedio de verano pueden ser 7F más cálidos en los condados de San Luis Obispo, Santa Bárbara y Ventura para 2100
- Los días de calor extremo podrían quintuplicarse para la década de 2060



General Soil Health Practices



Feed & Fuel Soil Biology

Protect Soil Biology & Habitat

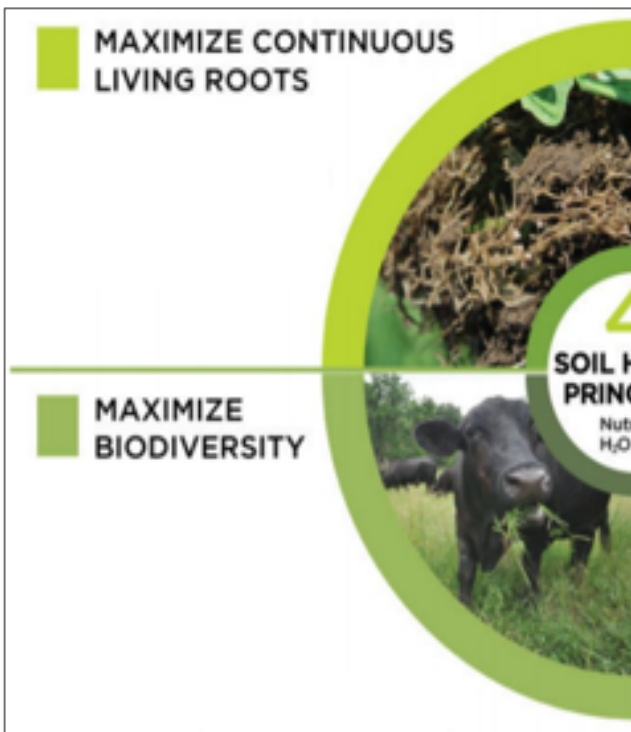


Applying Soil Health Management Systems to Reduce Climate and Weather Risks in the Northwest. 2019. Roesch-McNally, Moore-Kucera, & Owens.

<https://www.climatehubs.usda.gov/sites/default/files/Mngmt%20Systems%20Reduce%20Risks%20in%20the%20NW.pdf>

General Soil Health Practices

- Living cover absorbs solar radiation and sequesters carbon dioxide.
- Insulating the soil via mulches, cover crops, compost, leaving residues protects against extreme temperature changes **reduces plant stress**.
- Protecting soil surface reduces evaporative losses and keeps more water in the soil; water helps absorb heat from solar radiation, **helping soils stay cool in the summer**.
- These practices result in stabilizing soil to resist erosive forces of wind and water, **protect water quality, aid in infiltration, and water storage capacity**.



- Increasing organic inputs via cover cropping etc. builds organic matter and **sequesters carbon in the soil**.
- Cover crops chosen to capture and recycle nutrients may lead to enhanced internal nutrient cycling, **reducing the number of inputs needed**.
- Increasing biodiversity through practices like diversifying crop rotations, integrating livestock, adding diverse cover crops, hedgerows, etc., creates biological communities better equipped to resist disease and environmental stressors, which can **reduce pest pressure**.

Field Indicators for Soil Health

Surface/ Superficie



Surface Cover/Cubierta de superficie



Surface Crusting/Formación de costras en la superficie



Residue Breakdown/Desglose de residuos



Ponding/estanque

Soil Physical/ Física del suelo



Penetration resistance / Resistencia



Soil Structure & Color / Estructura y color del suelo



Aggregate Stability / Estabilidad de agregados



Erosion/Erosión

Soil Biological/ suelo biológico



Biopores/bioporos



Root Depth & Distribution / Profundidad y distribución de raíces



Biological Activity / Actividad biológica

Field Conditions to Avoid/Prevent / Condiciones de campo a evitar/prevenir

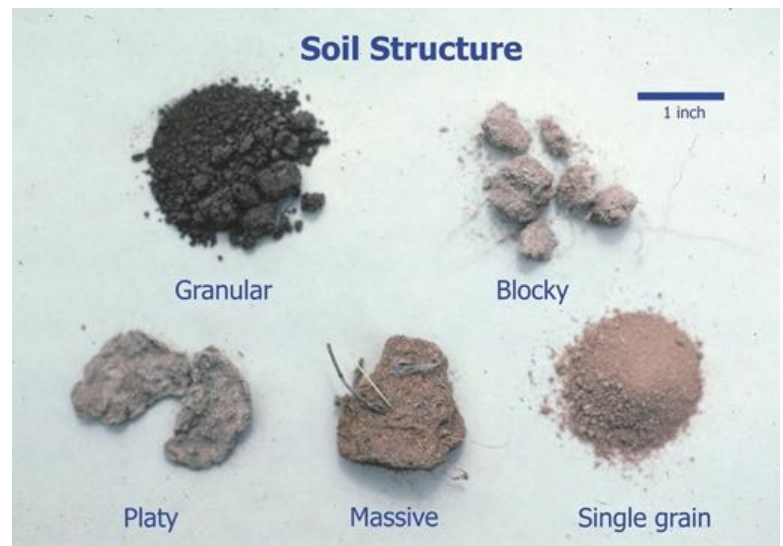
Compaction or Salinity

- Decreased rooting depth, plant growth
- Decreased biological biomass & activity
- Poor infiltration, drainage, aeration, & water storage



Soil Organic Matter Depletion or Aggregate Instability

- Reduced habitat and soil biological activity
- Increased ponding and soil erosion
- Reduced nutrient-holding capacity
- Reduced water infiltration, water holding capacity, aeration
- Decreased resilience to extreme weather
- Plant stress



Soil Organism Habitat Degradation

- Quantity, quality, diversity or connectivity of food, cover, space, shelter and/or water is inadequate to meet requirements of soil organisms

Signs of Healthy Soil

Surface



- ★ ~~Absence of crusting, ponding, erosion~~
- ★ 70%+ of surface is covered
- ★ Residue breaks down within 1-2 seasons
- ★ Wire flag or penetration resistance meter goes easily into soil to at least 10"

Belowground



Source: Moore-Kucera



Source: Moore-Kucera



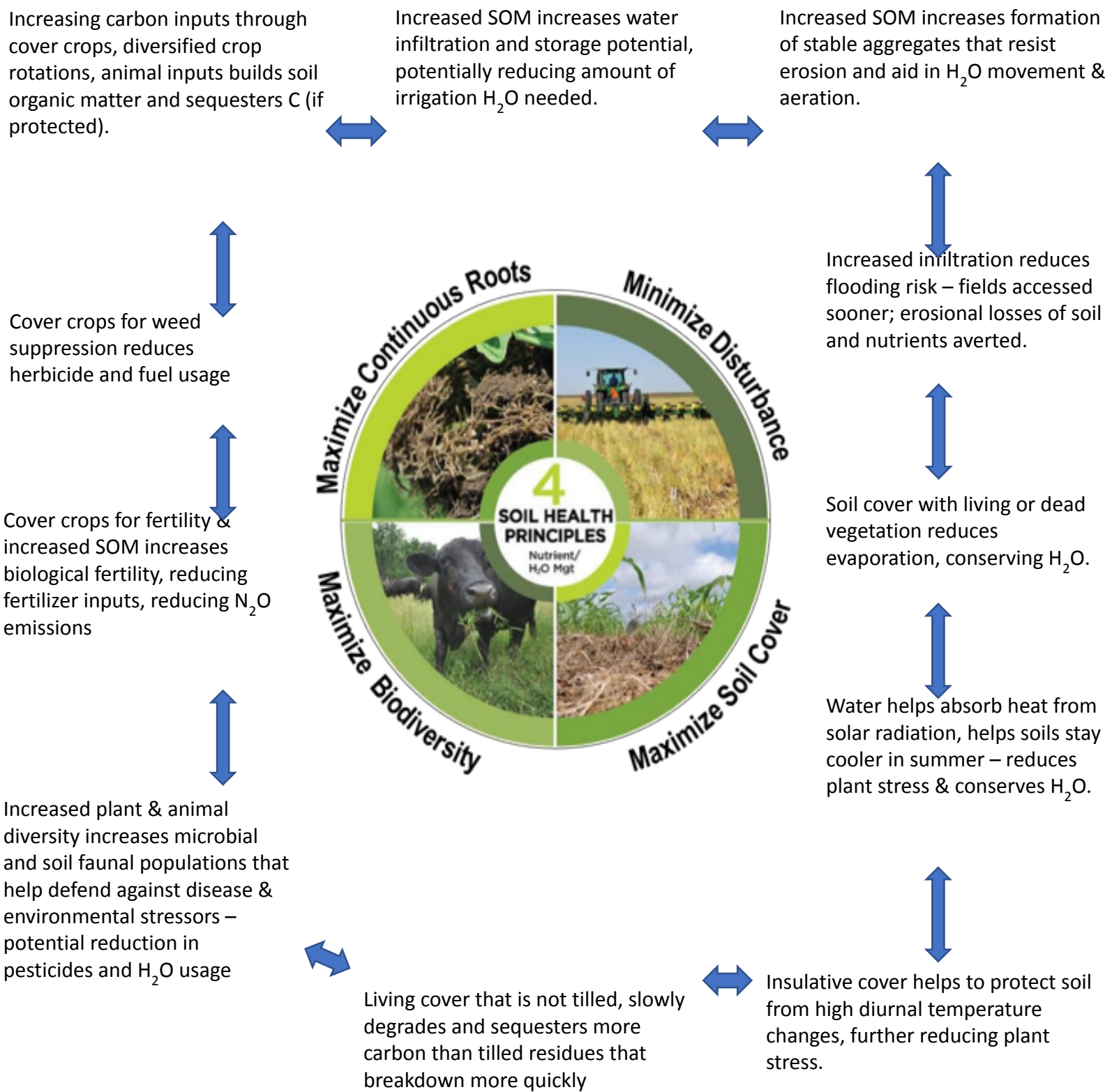
Source: NRCS



Source: B. Smith

- ✓ Residues mixed by biological activity into surface layers
- ✓ Dark soil color (deeper the better)
- ✓ Soil has granular structure (absence of platy structure)
- ✓ **Soil maintains structure during slake or slump test**

Linking Soil Health Practices To Climate Mitigation & Resiliency



SAVING THE LAND THAT SUSTAINS US

Why does dry farming work? / ¿Por qué funciona la agricultura de secano?

- Climate
 - Temperature
 - Marine influence
 - Rainfall (ideally 20+ inches)
- Increased soil water (holding capacity)
 - Inherent aspects
 - Clay content
 - Management
 - Cover crop
 - Dust mulch
 - Nutrient delivery
 - Larger spacing
 - Crop rotation?
- Clima
 - Temperatura
 - influencia marina
 - Lluvia (idealmente más de 20 pulgadas)
- Aumento del agua del suelo (capacidad de retención)
 - Aspectos inherentes
 - Contenido de arcilla
 - Gestión
 - Cultivo de cobertura
 - mantillo de polvo
 - Entrega de nutrientes
 - Espaciado más grande
 - ¿La rotación de cultivos?



Economic considerations/ Consideraciones económicas

Pros and cons

- Better flavor → Higher price
 - For tomatoes, \$2-5 per lb
 - This may not be true for other crops
- Lower yields
 - For tomatoes, 1.5 - 2.5 kg/plant for highest quality fruit
 - 4-5 kg/plant for higher water content fruit
- Mejor sabor → Precio más alto
 - Para tomates, \$2-5 por libra
 - Esto puede no ser cierto para otros cultivos.
- Rendimientos más bajos
 - Para tomates, 1,5 - 2,5 kg/planta para fruta de la más alta calidad
 - 4-5 kg/planta para frutos con mayor contenido de agua

Produced with support from:

