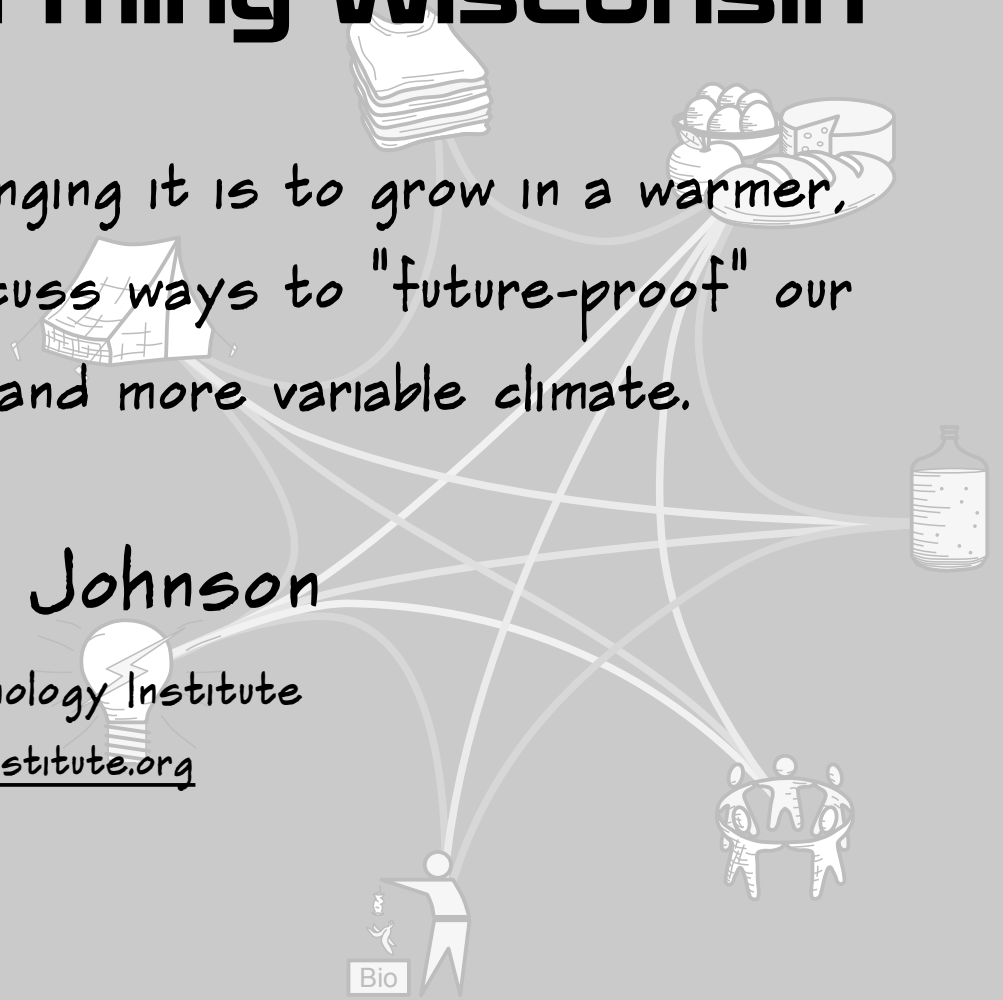
Gardening in a Warming Wisconsin

This last year shows us how challenging it is to grow in a warmer, drier Wisconsin. Today, we will discuss ways to "future-proof" our food gardens for a changing and more variable climate.

Scott A. J. Johnson

Director, Low Technology Institute

scott@lowtechinstitute.org



Gardening in a Warming Wisconsin

Today's Topics

The Changing Growing Season

Adaptations for Today

Adaptations for Tomorrow

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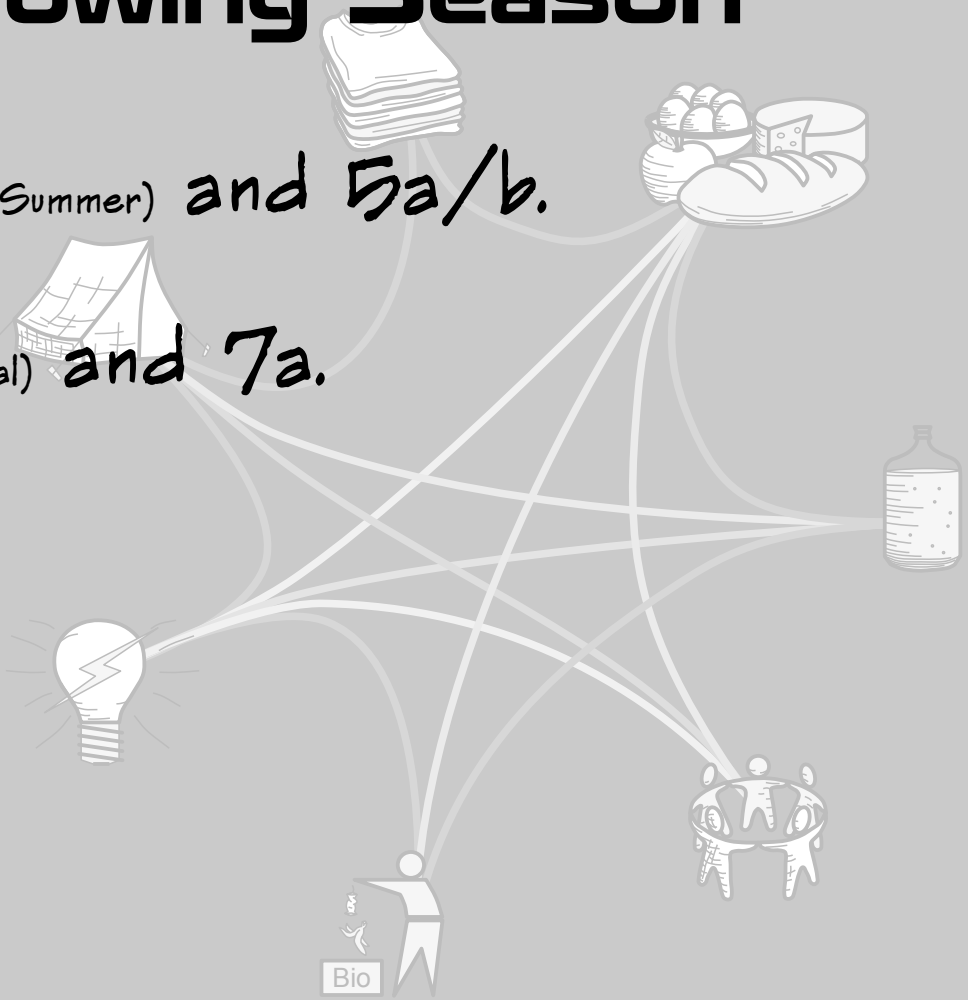
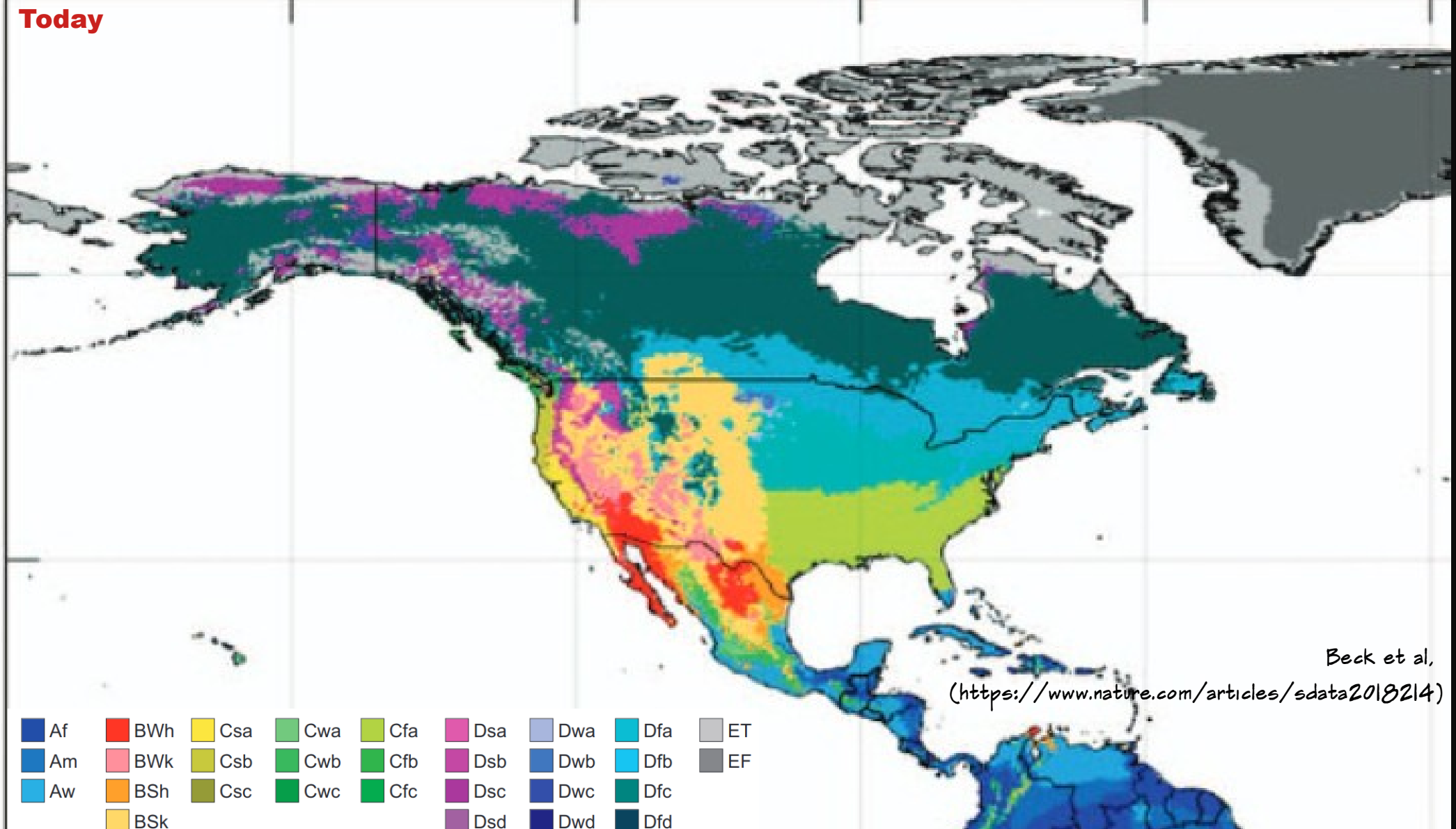
The Changing Growing Season

- Today's Dfa (Continental, Humid, Hot Summer) and 5a/b.
- Tomorrow's Cfa (Humid, Subtropical) and 7a.

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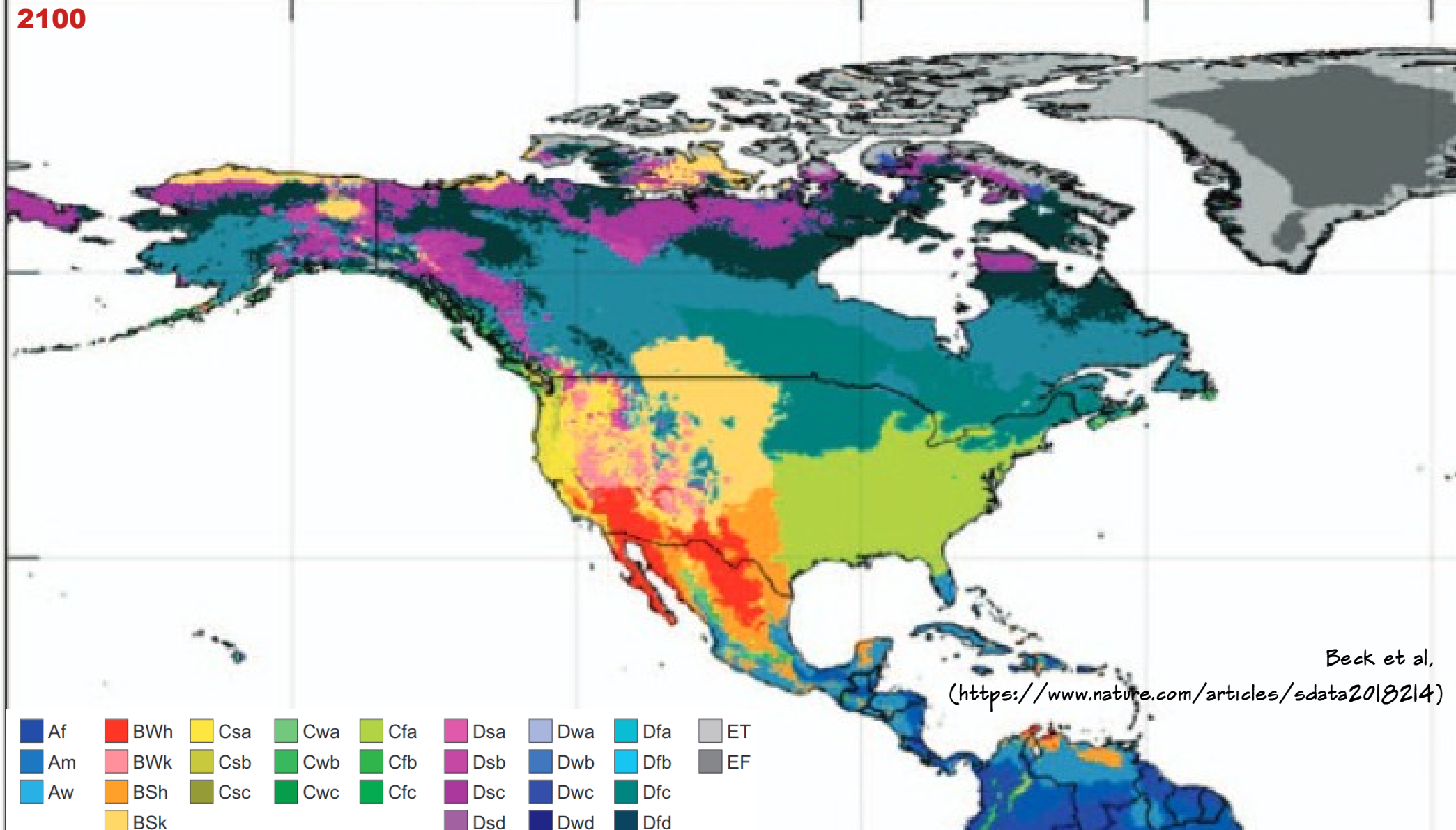
(https://www.nature.com/articles/sdata2018214)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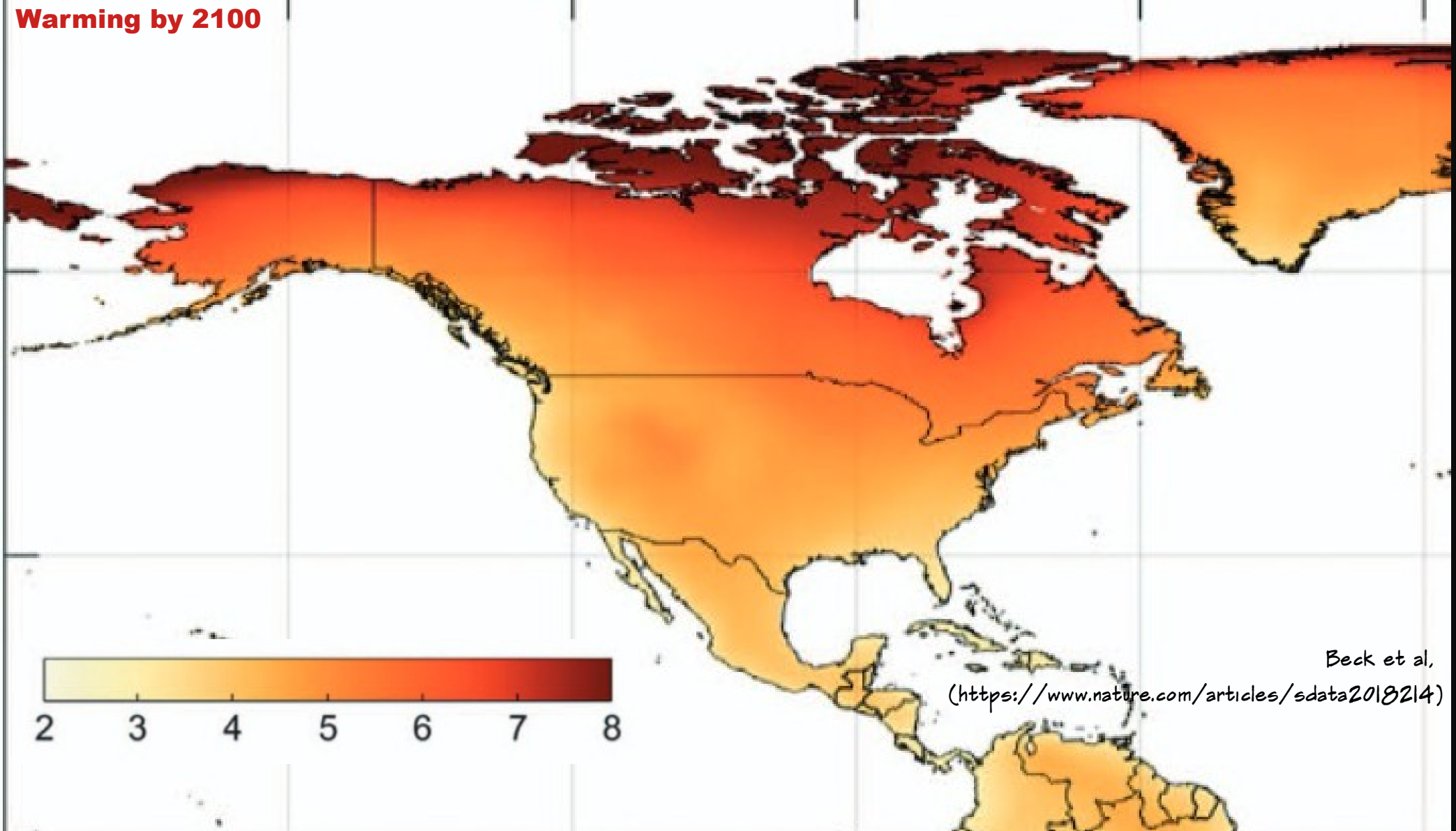
Warming by 2100
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Beck et al,
(https://www.nature.com/articles/sdata2018214)

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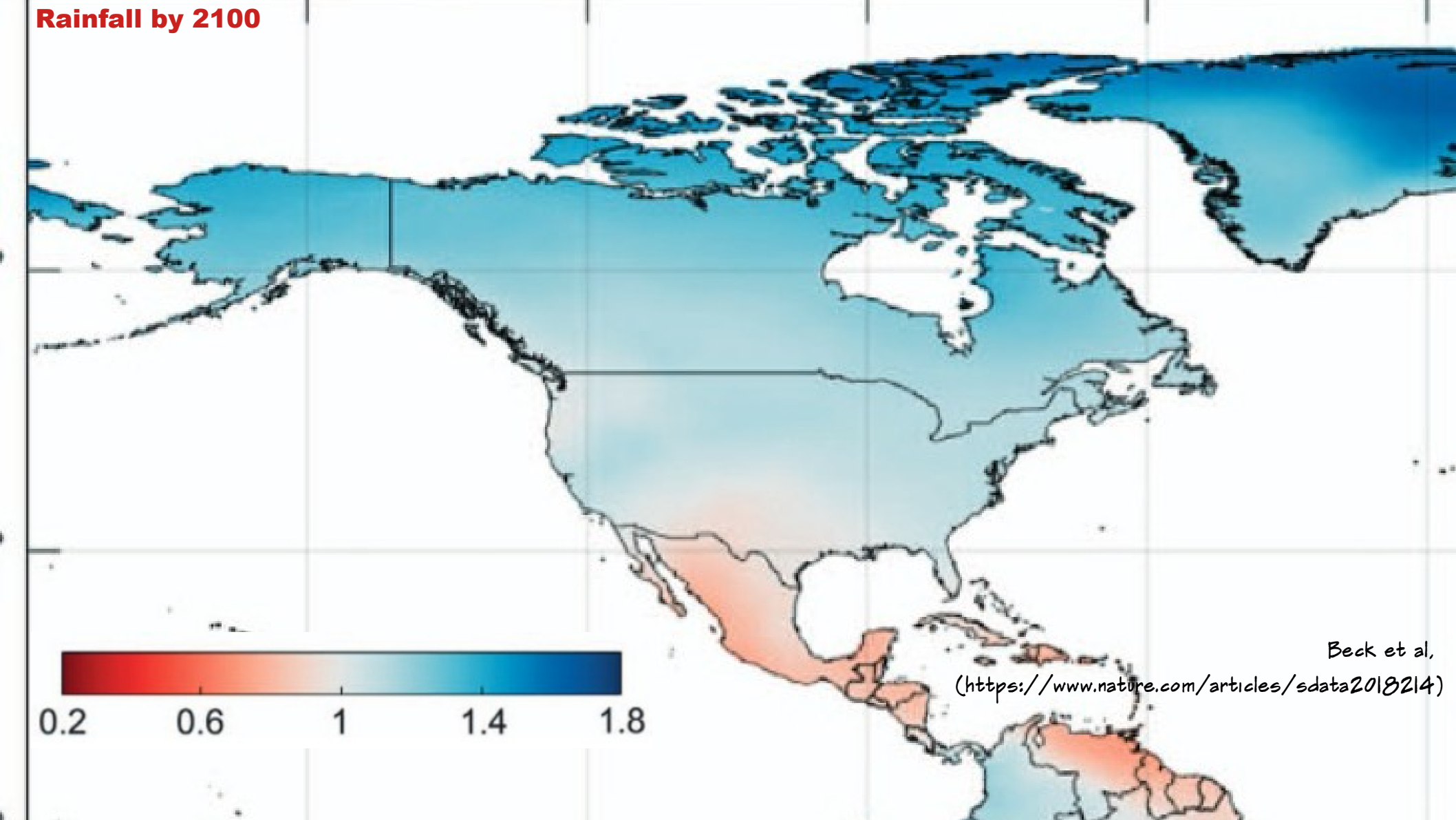
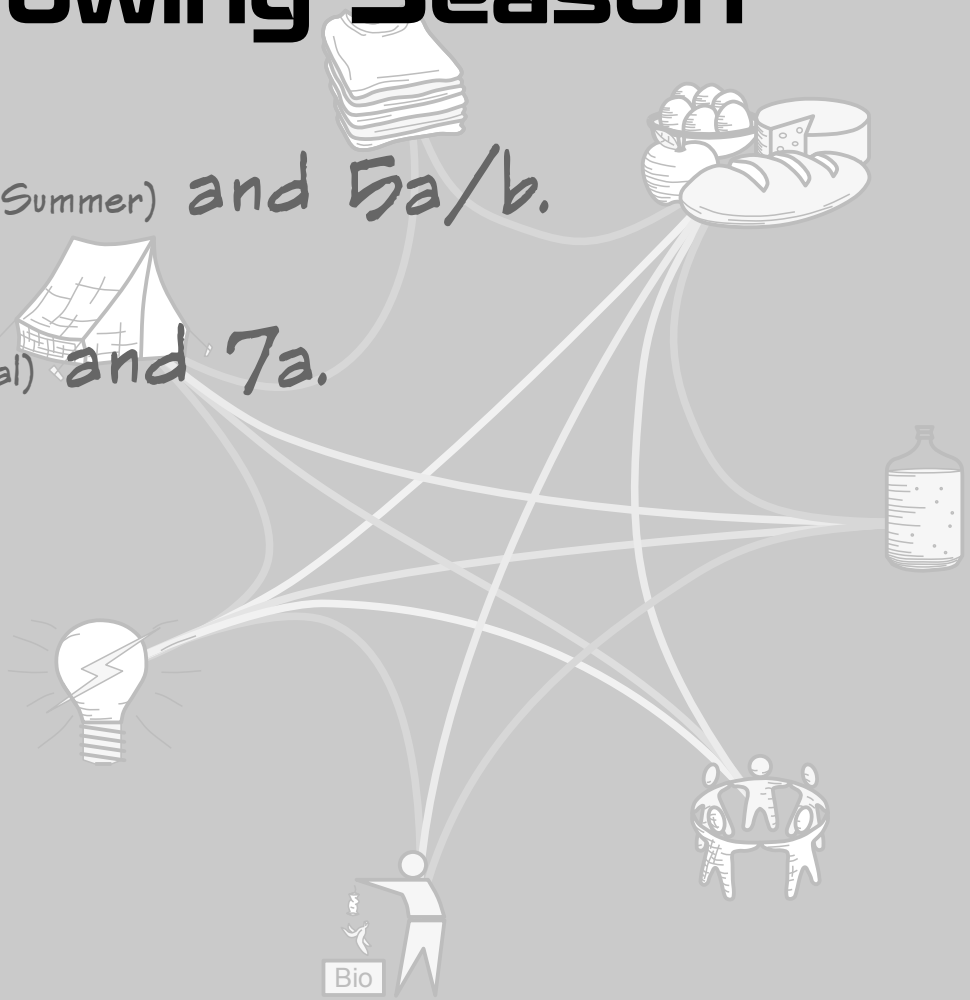
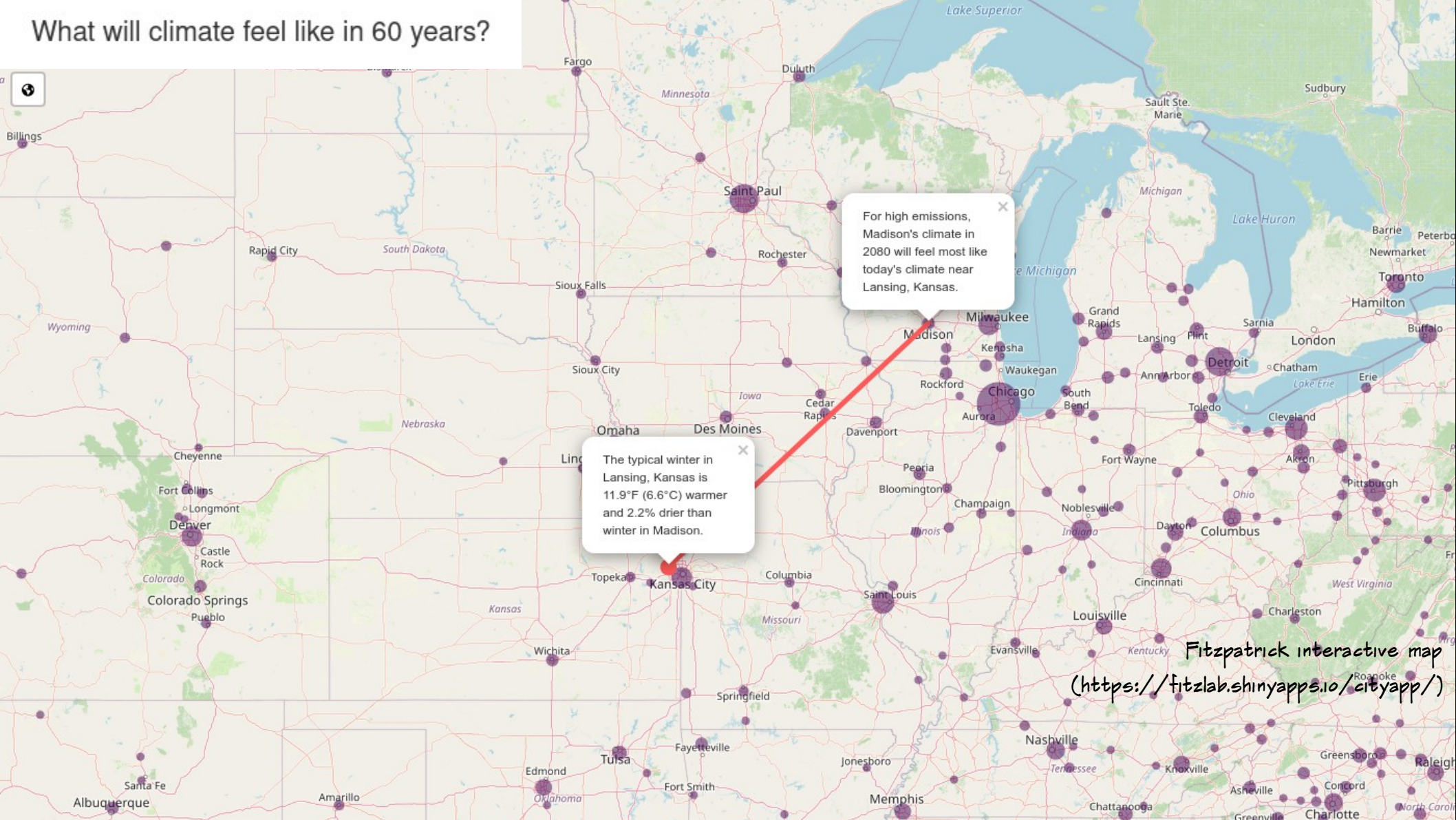


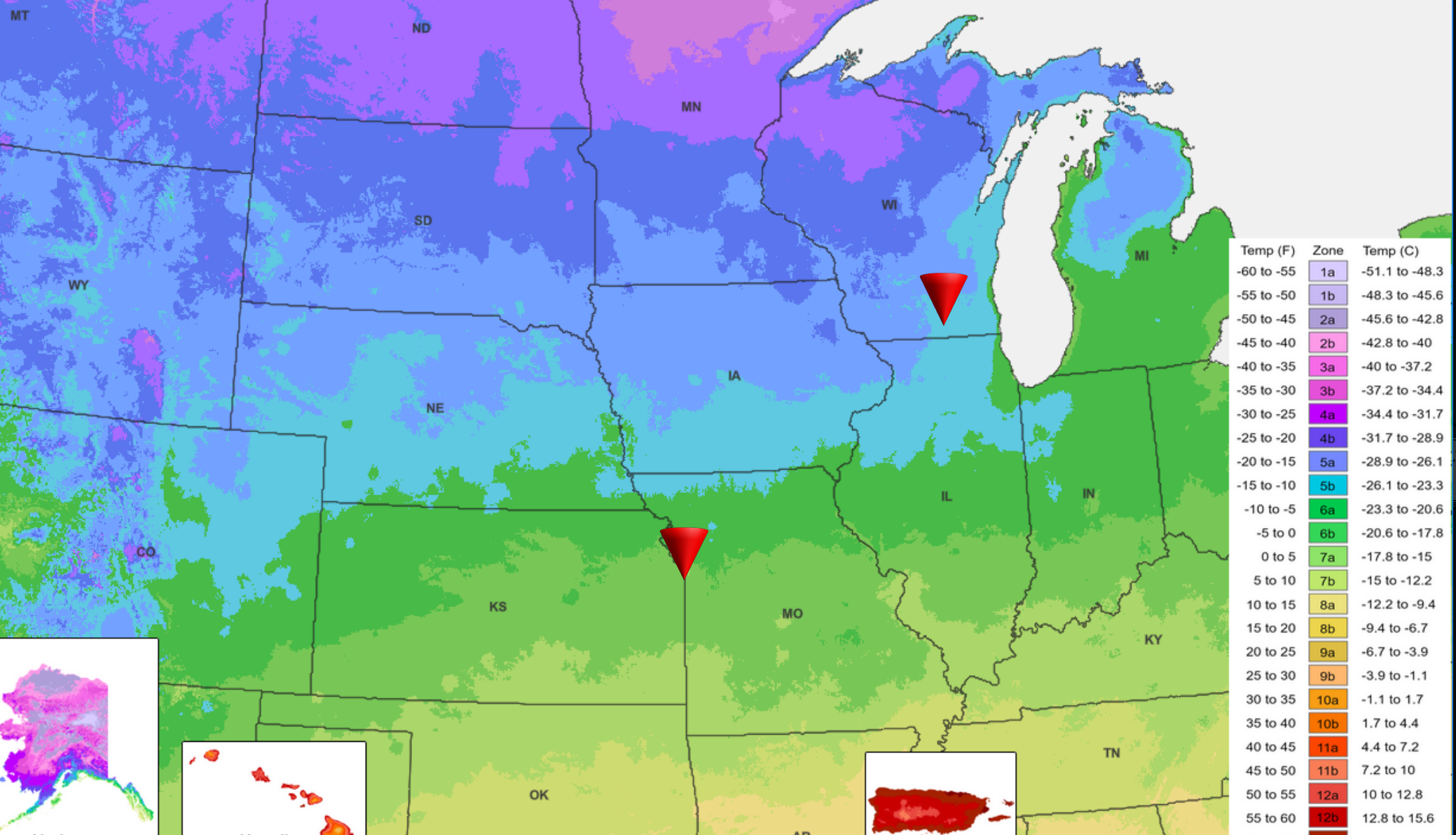
Beck et al,
(https://www.nature.com/articles/sdata2018214)

The Changing Growing Season

- Today's Dfa (Continental, Humid, Hot Summer) and 5a/b.
- Tomorrow's Cfa (Humid, Subtropical) and 7a.
- Analogues?




What will climate feel like in 60 years?
For high emissions, Madison's climate in 2080 will feel most like today's climate near Lansing, Kansas.
The typical winter in Lansing, Kansas is 11.9°F (6.6°C) warmer and 2.2% drier than winter in Madison.
Madison
Kansas City
Fitzpatrick interactive map
(https://fitzlab.shinyapps.io/cityapp/)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Temp (F) Zone Temp (C)
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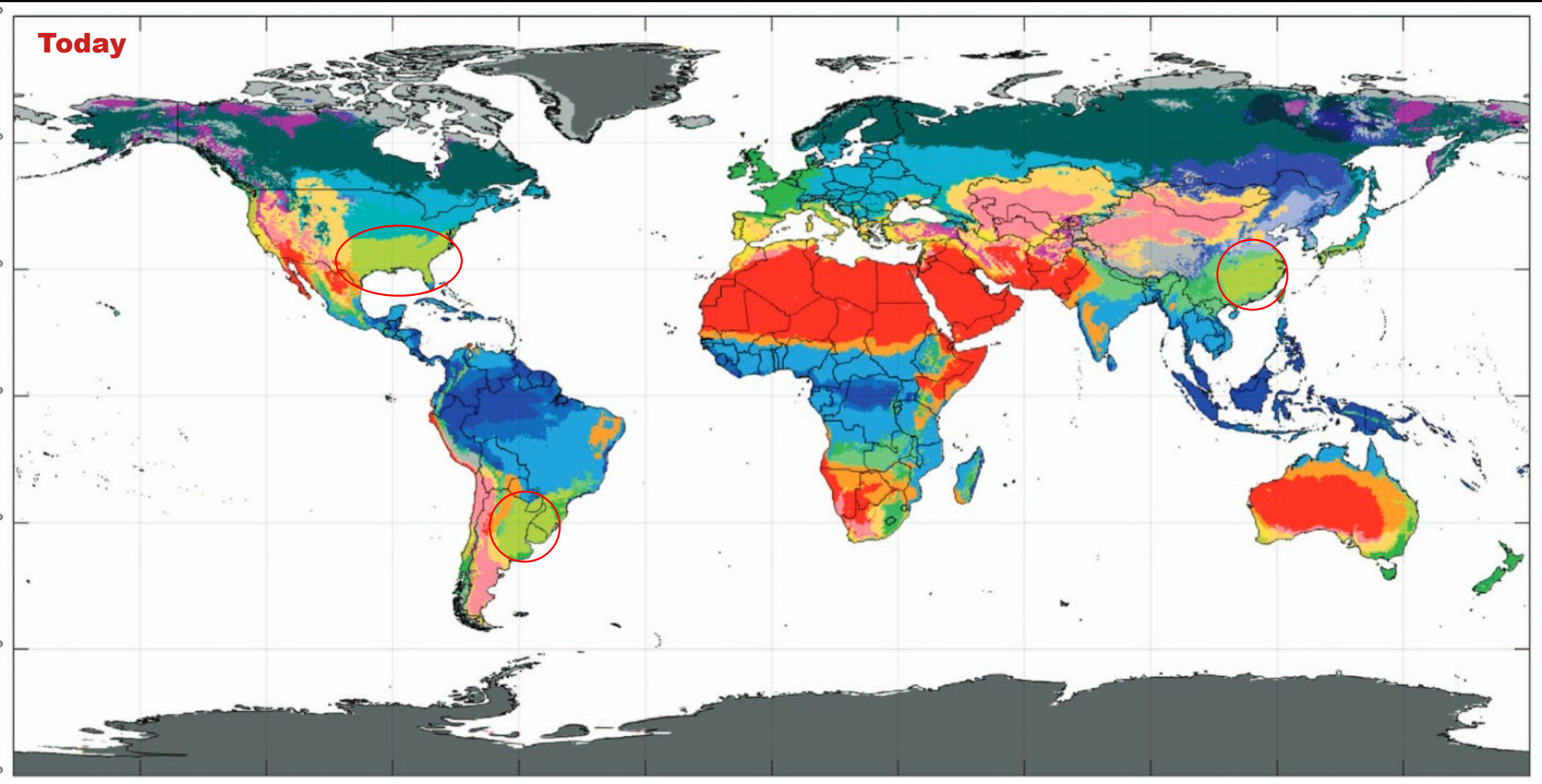
-55 to -50 1b -48.3 to -45.6
-50 to -45 2a -45.6 to -42.8
-45 to -40 2b -42.8 to -40
-40 to -35 3a -40 to -37.2
-35 to -30 3b -37.2 to -34.4
-30 to -25 4a -34.4 to -31.7
-25 to -20 4b -31.7 to -28.9
-20 to -15 5a -28.9 to -26.1
-15 to -10 5b -26.1 to -23.3
-10 to -5 6a -23.3 to -20.6
-5 to 0 6b -20.6 to -17.8
0 to 5 7a -17.8 to -15
5 to 10 7b -15 to -12.2
10 to 15 8a -12.2 to -9.4
15 to 20 8b -9.4 to -6.7
20 to 25 9a -6.7 to -3.9
25 to 30 9b -3.9 to -1.1
30 to 35 10a -1.1 to 1.7
35 to 40 10b 1.7 to 4.4
40 to 45 11a 4.4 to 7.2
45 to 50 11b 7.2 to 10
50 to 55 12a 10 to 12.8
55 to 60 12b 12.8 to 15.6

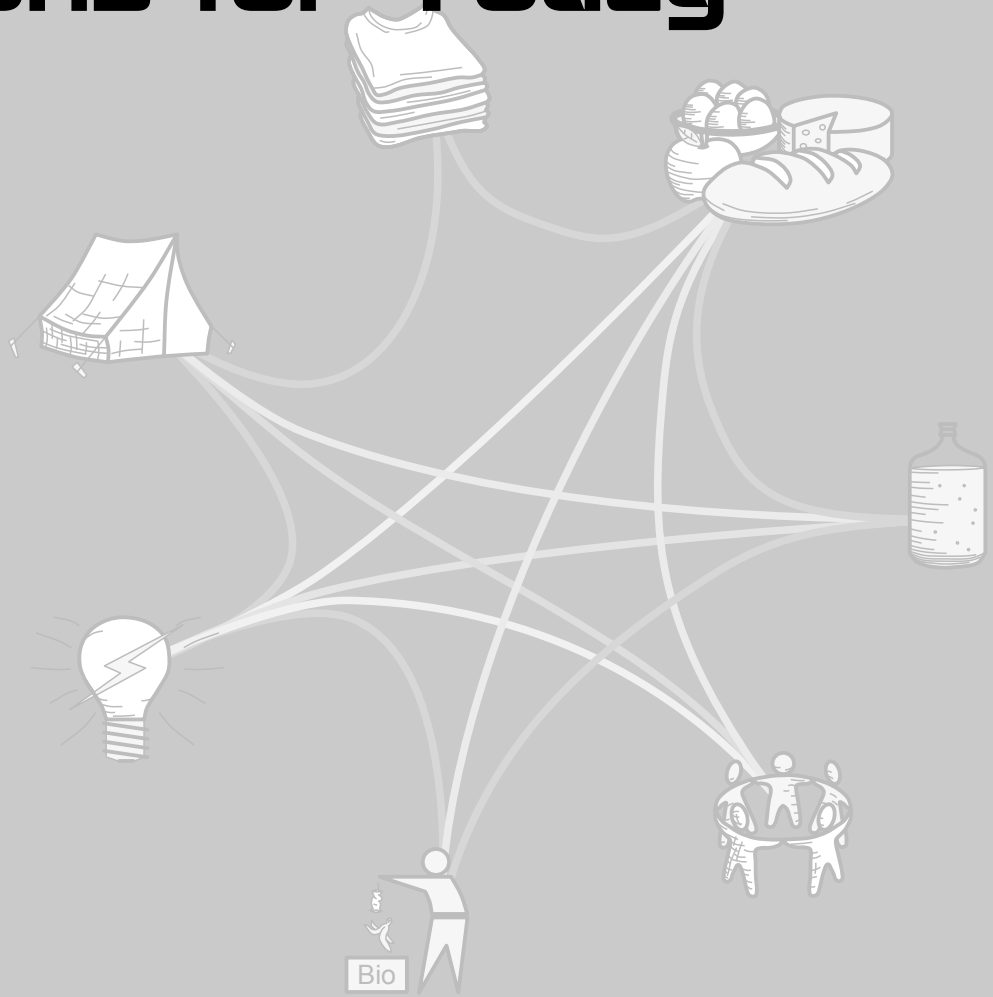

Today

Adaptations for Today

- Botanical
- Methodological
- Gardener

Botanical **Adaptations for Today**

- More Varieties



StackExchange

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TEAMS

Stack Overflow for

Which tomatoes grow the best in high temperatures?

Asked 8 years, 6 months ago Modified 5 years ago Viewed 8k times

20

Which tomato varieties have the most heat tolerance?

I live in a dry area (a steppe climate, or a Bsk climate with very hot summers), where the daytime highs are usually 89° F. or above in summer (up to about 116° F. at the most; temperatures that high are infrequent, but it's not uncommon for it to be over 100° F. for extended periods), and

Featured on Meta

Site maintenance - Thursday, Febru 2024 @ 01:00 UTC (Wednesday, January...

What would you like to change abo moderator elections?

HEAT-TOLERANT TOMATO VARIETIES

If you think summers are too hot to grow tomatoes, think again.

Some gardeners make the mistake of trying to grow standard tomatoes in a climate where growing conditions aren't right for finicky plants. But with all the new tomato varieties that have been discovered and developed, there are a few tomato varieties that will grow just about anywhere, and many others that are particularly suited to certain regions, weather patterns and temperature ranges.

Here is our plant list of heat-tolerant tomato varieties that will survive the Kansas summers.

Heat Tolerant Tomatoes

Varietes in bold can be found on our "Try Me" table at the shop.

*denotes varieties we carry.

- Arkansas Traveler
- Bella Rosa*
- BHN-216
- Black Cherry*
- Celebrity*
- Costoluto Genovese *
- Eva Purple Ball
- Florida 91*
- Grape*
- Hazelfield Farm
- Heat Master (1-Gallon) * *NEW*
- Homestead 24F *
- Neptune
- Ozark Pink
- Phoenix
- Sioux*
- Solar Fire (1-Gallon) * *NEW*
- Summer Set
- Sun Leaper
- Sun Pride
- Sunchaser
- Sunmaster
- Sweet Chelsea *
- Sweet Millions *

Organic Gardening, USDA Zone 6B

GROWING TOMATOES IN ZONE 6B: COMPLETE GUIDE

ame vanorio · March 3, 2022

Search

Homegrown tomatoes are the ultimate in taste and texture. So much better than the cardboard grocery knockoff ones. Tomatoes need some care but are easy to grow and productive, saving you lots of money.

This is a complete guide to types and varieties that do well in Zone 6B, how to choose tomatoes, and how to grow your tomatoes from seed.

TYPES OF TOMATOES

There are seven main types of tomatoes each with many different varieties. The grower typically chooses what types to grow based on what they plan to do with the tomato.

HERE IS A LIST OF THE TYPES AND MY PERSONAL FAVORITES FOR ZONE 6B.

1. **BEEFSTEAK**

The giants of the tomato world these big guys can get to two pounds or more. Beefsteaks tend to have a more mild flavor. They are great sliced for sandwiches and burgers.

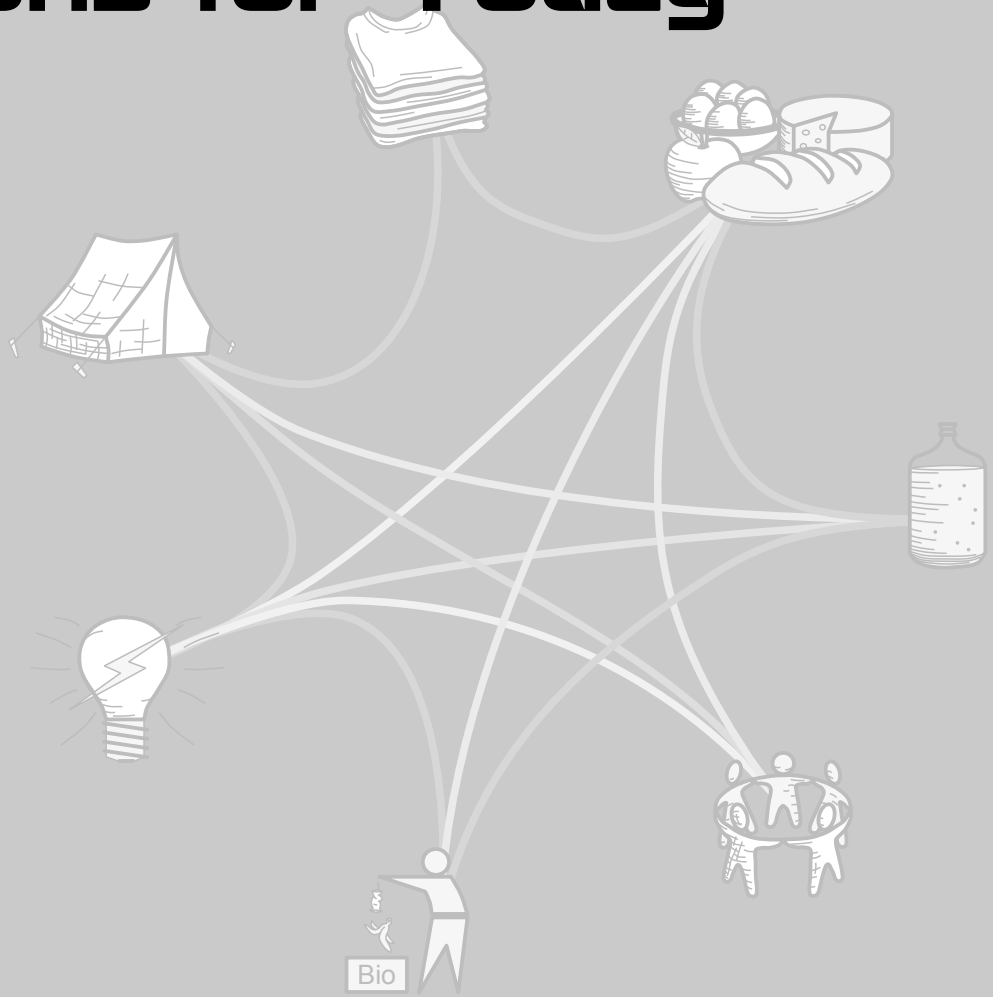
The plants get quite tall so they do need plenty of room and some serious support.

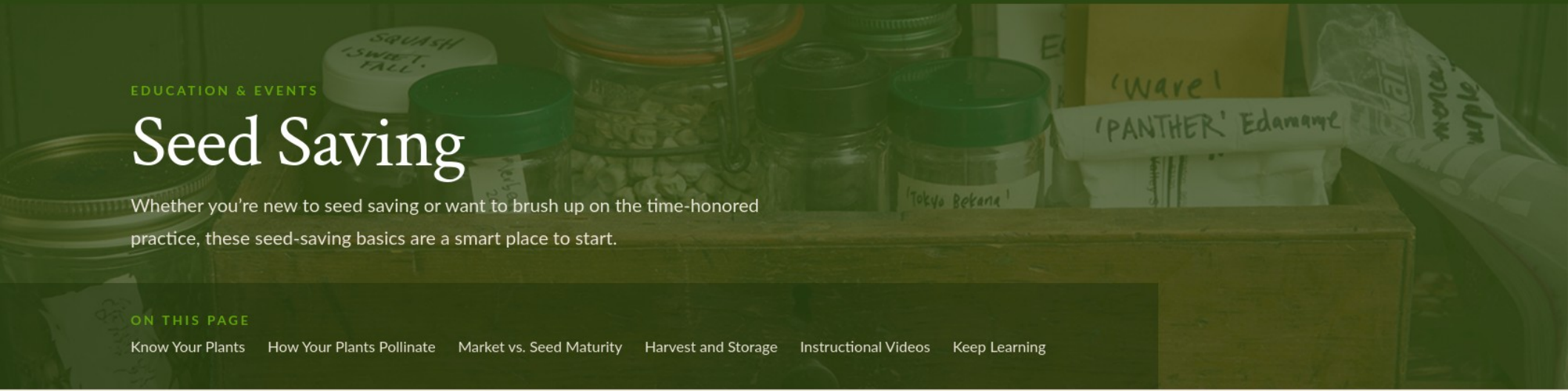
STRIPED GERMAN

Beefsteaks come in a multitude of colors. Striped German from Johnny's is an heirloom variety that is a marbled yellow and red. They have excellent flavor and take 78 days to mature.

Botanical **Adaptations for Today**

- More Varieties
- Save Seeds





EDUCATION & EVENTS

Seed Saving

Whether you're new to seed saving or want to brush up on the time-honored practice, these seed-saving basics are a smart place to start.

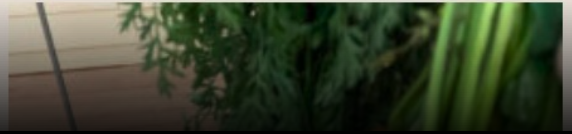
ON THIS PAGE

Seed Saving

Know Your Plants

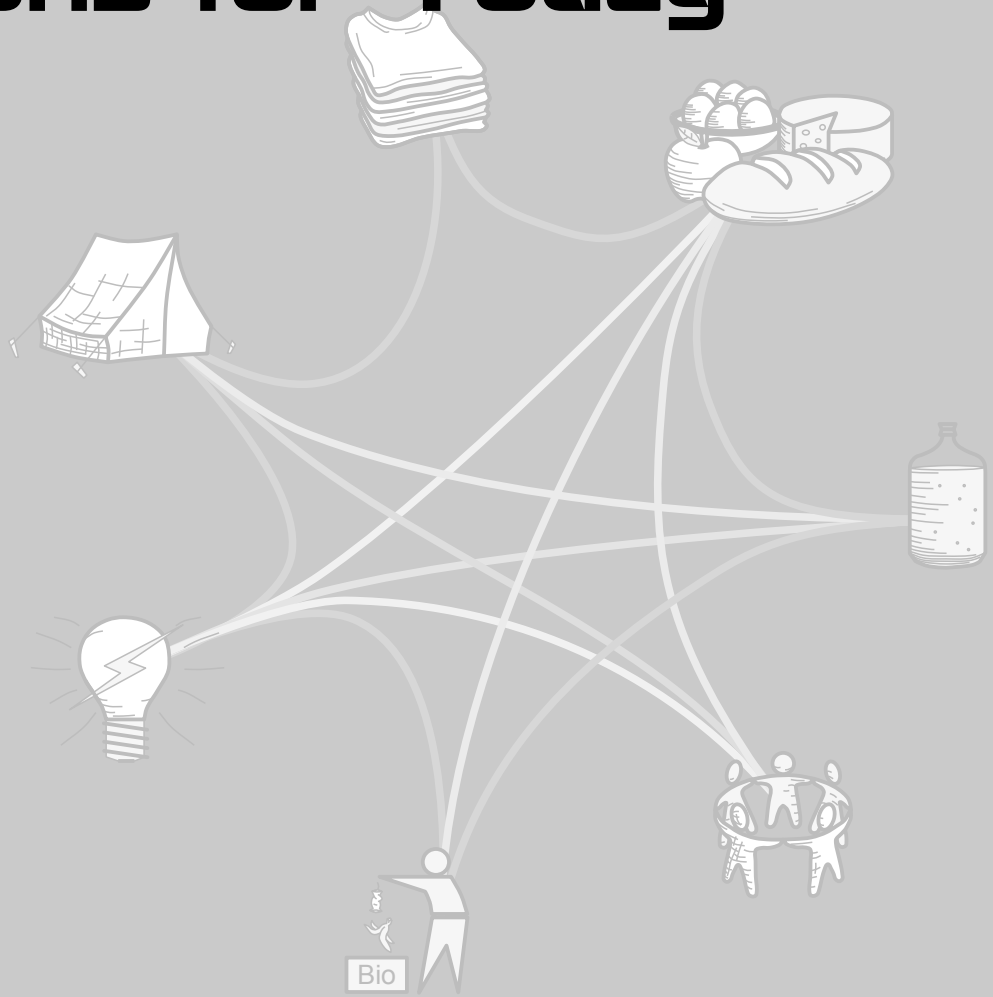
Know whether your parent plant is a hybrid or open-pollinated variety.

Hybrids, which are created by crossing plants of two different varieties, generally do not produce offspring with the same traits as the parent plant. Seeds saved from open-pollinated varieties, on the other hand, will produce plants identical to the parent. Seed Savers Exchange offers only open-pollinated varieties through its online and print catalog and on The Exchange, its gardener-to-gardener seed swap.



Botanical **Adaptations for Today**

- More Varieties
- Save Seeds
- Dwarf Those Plants



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COLORADO STATE UNIVERSITY
COLLEGE OF AGRICULTURAL SCIENCES
Specialty Crops

MENU

Lettuce- Bolting Resistance

INTRODUCTION:

Bolting (flower initiation) in lettuce is a common problem for produ
temperatures rise above 85°F . Colorado's Front Range is not kno
area; however there are growers that successfully produce lettuce
While good production in the summer months requires special att
varieties of lettuce resist bolting better than others. In this initial st
every two weeks, starting in June, and ending in September to ev
develop a protocol for expanded studies in the following years.

The varieties that we worked with were those provided by seed co
grown here, and others which are not. All production practices ha

There is also interest in the health and nutritional quality of lettuce
with darker red pigments. The Department of Food Science and H
University is collaborating with the Specialty Crops Program to st
levels in the different lettuce varieties.

OBJECTIVES

1. To test 50 different varieties of lettuce over the g
   resistance.
2. To test the levels of antioxidant and Vitamin E le

How to Grow Kale in Zone 9

Nature has created kale to be a cool-weather plant and, so far, botanists haven't created a truly heat-tolerant variety. This means that growing zone 9 kale plants requires strategy, and perhaps a little trial and error. For starters, plant kale in shade, and be sure to give it plenty of water during warm weather. Here are a few more helpful tips from zone 9 gardeners:

- Plant kale seeds indoors in late winter, then transplant the seedlings into the garden in early spring. Enjoy the harvest until the weather gets too warm, then take a break and resume harvesting your kale when the weather is cooler in autumn.
- Succession plant kale seeds in small crops – maybe a batch every couple of weeks. Harvest the baby kale when the leaves are young, sweet, and tender – before they get tough and bitter.
- Plant kale in late summer or early autumn, then harvest the plant when the weather is cool the following spring.

Collards vs. Zone 9 Kale Plants

If you decide that growing hot weather kale is just too challenging, consider collard greens. Collards get a bad rap but, in reality, the two plants are closely related and, genetically, they are nearly identical.

Nutritionally, kale is slightly higher in vitamin A, vitamin C, and iron, but collards have more fiber, protein, and calcium. Both are rich in antioxidants, and both are superstars when it comes to folate, potassium, magnesium, vitamin E, B2, and B6.

The two are usually interchangeable in recipes. In fact, some people prefer the slightly milder flavor of collard greens.

Renee's Garden
The Garden to Table Seed Company

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Italian Heirloom Kale
Lacinato

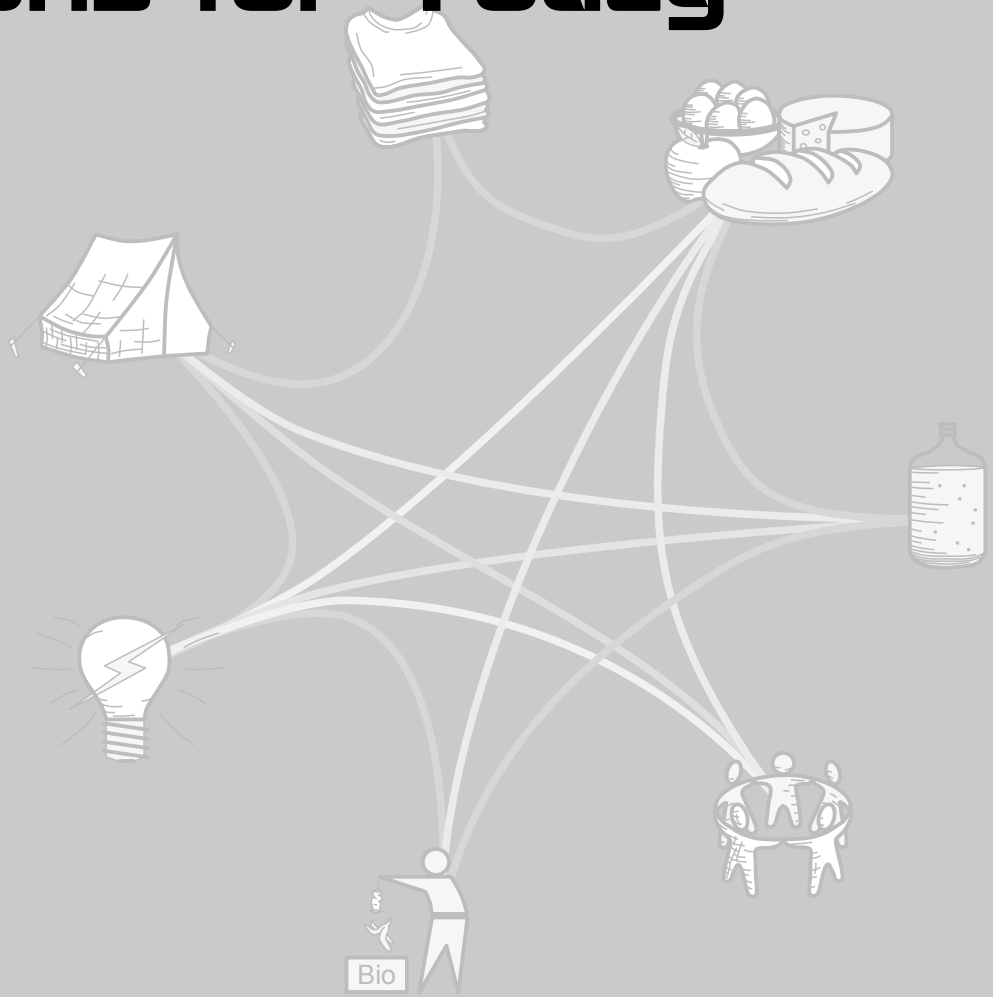
EXCLUSIVE - This unique heirloom's thick crinkled leaves are a beautiful deep blue-green that is an absolute standout in the garden. Lacinato has a fine, sweet, full flavor; never strong or overbearing. This distinctive Italian favorite (also nicknamed "dinosaur kale" because of its primeval appearance) is both cold and heat tolerant in all climate zones. You can harvest big delicious bouquets of nutrition-packed, richly-colored leaves for months to steam, sauté, braise or use in hearty soups and stews.

Seed Count: Approx. 275 / Weight: 800 mg

$ 2.99 1 Add to Cart

Botanical **Adaptations for Today**

- More Varieties
- Save Seeds
- Dwarf Those Plants
- Note your Perennials



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College of Agricultural and Environmental Sciences

Home • News & Events • UC Davis Part of Team Studying Wildfire Risks and Wine

UC Davis Part of Team Studying Wildfire Risks and Wine

by Emily C. Dooley | November 02, 2021

UC Davis is part of a team of western land grant universities sharing a $7.5 million grant from the U.S. Department of Agriculture to study the effect of wildfire smoke on grapes and wine.

Diversity buffers winegrowing regions from climate change losses

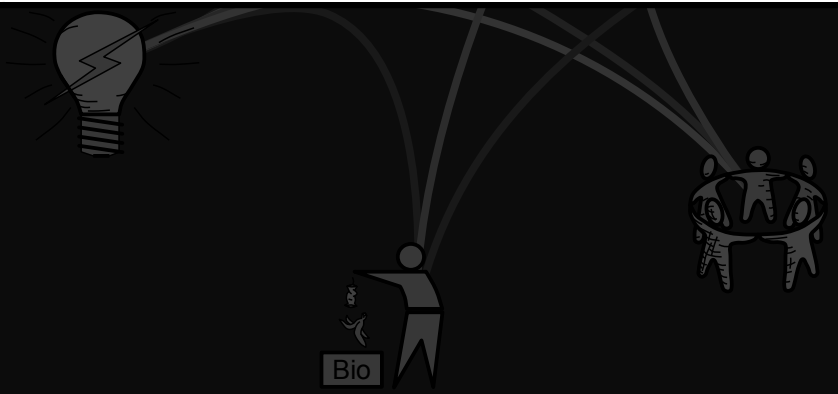
Ignacio Morales-Castilla[a,b,c,1], Iñaki García de Cortázar-Atauri[d], Benjamin I. Cook[e,f], Thierry Lacombe[g], Amber Parker[h], Cornelis van Leeuwen[i], Kimberly A. Nicholas[j], and Elizabeth M. Wolkovich[b,c,k]

[a]Global Change Ecology and Evolution (GloCEE) Group, Department of Life Sciences, University of Alcalá, Alcalá de Henares 28805, Spain; [b]The Arnold Arboretum, Harvard University, Boston, MA 02131; [c]Department of Organismic and Evolutionary Biology, Harvard University, Cambridge, MA 02138; [d]Unité de Service 1116 AgroClim, Institut National de la Recherche Agronomique, F-84914 Avignon, France; [e]NASA Goddard Institute for Space Studies, New York, NY 10025; [f]Division of Ocean and Climate Physics, Lamont-Doherty Earth Observatory, Columbia University, Palisades, NY 10964; [g]Amélioration Génétique et Adaptation des Plantes (AGAP), Institut National de la Recherche Agronomique (INRA), Montpellier SupAgro, Université Montpellier, F-34060 Montpellier, France; [h]Department of Wine, Food, and Molecular Biosciences, Faculty of Agriculture and Life Sciences, Lincoln University, Lincoln 7647, Christchurch, New Zealand; [i]Ecophysiologie et Génomique Fonctionnelle de la Vigne (EGFV), Bordeaux Sciences Agro, Institut National de Recherche pour l'Agriculture, l'Alimentation et l'Environnement (INRAE), Université Bordeaux, Institut des Sciences de la Vigne et du Vin (ISVV), 33882 Villenave d'Ornon, France; [j]Lund University Centre for Sustainability Studies, Lund University, SE-221 00, Lund, Sweden; and [k]Forest and Conservation Sciences, Faculty of Forestry, University of British Columbia, Vancouver, BC V6T 1Z4, Canada

Edited by Nils Chr. Stenseth, University of Oslo, Oslo, Norway, and approved December 17, 2019 (received for review April 19, 2019)

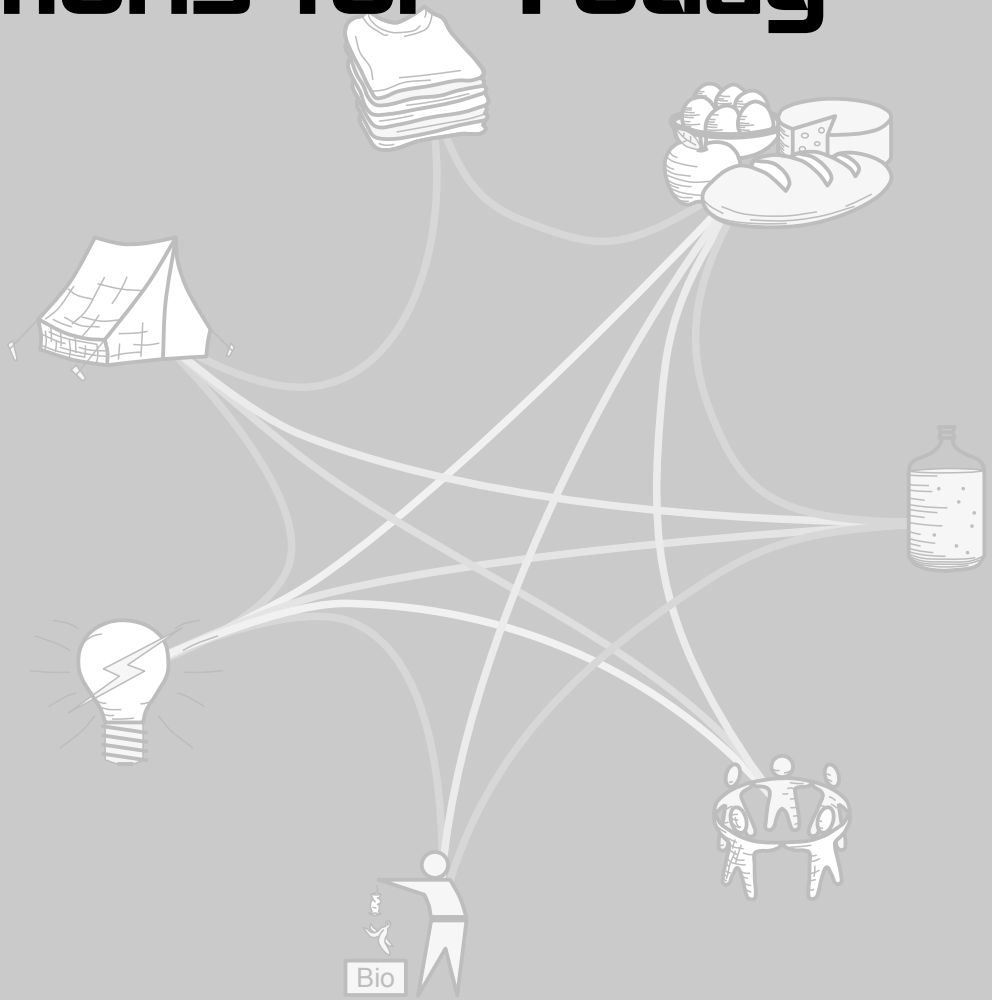
Agrobiodiversity—the variation within agricultural plants, animals, and practices—is often suggested as a way to mitigate the negative impacts of climate change on crops [S. A. Wood *et al.*, *Trends Ecol. Evol.* 30, 531–539 (2015)]. Recently, increasing research and attention has focused on exploiting the intraspecific genetic variation within a crop [Hajjar *et al.*, *Agric. Ecosyst. Environ.* 123, 261–270 (2008)], despite few relevant tests of how this diversity modifies agricultural forecasts. Here, we quantify how intraspecific diversity, via cultivars, changes global projections of growing areas. We focus on a crop that spans diverse climates, has the necessary records, and is clearly impacted by climate change: winegrapes (predominantly *Vitis vinifera* subspecies *vinifera*). We draw on long-term French records to extrapolate globally for 11 cultivars (varieties) with high diversity in a key trait for climate change adaptation—phenology. We compared scenarios where climate regimes (2). Such traits include a cultivar's heat and drought tolerance and its phenology—the timing of recurring developmental stages, such as budburst and maturity. Variation in phenology may be a particularly important trait for developing agricultural systems resilient to climate change, as differences in cultivar phenology (e.g., an early versus late-ripening cultivar) can translate to very different climatic conditions during critical developmental phases, such as fruit maturation.

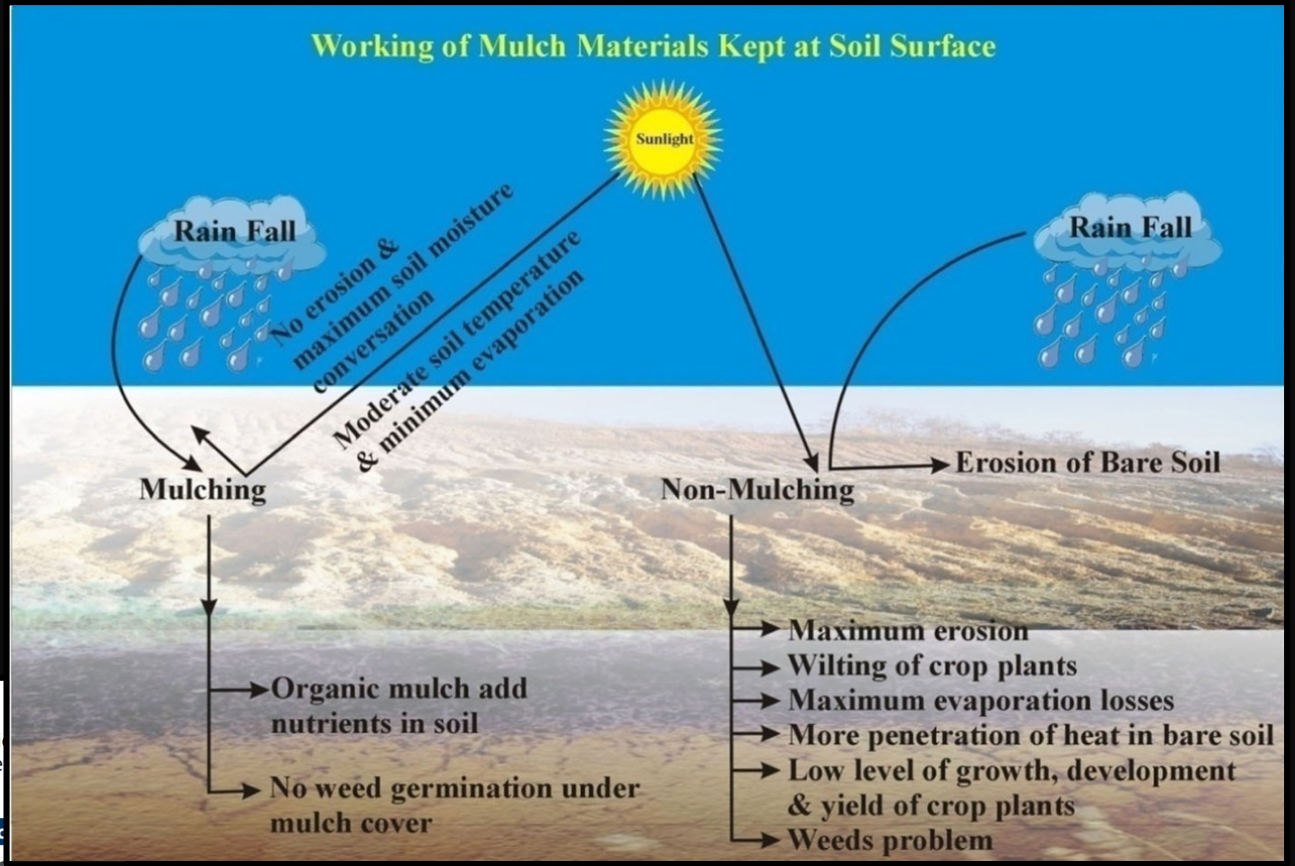
Given enough variation in traits—such as phenology—across cultivars, growers could select and plant cultivars suited to their current climate, then shift to more appropriate cultivars over time as the climate shifts, a process we refer to as "turnover." Cultivar turnover is expected to increase the resilience of agricultural systems and thus lead to improved agricultural forecasts



Methodological **Adaptations for Today**

- Improve Soil Health





Iqbal *et al. Bulletin of the National Research Centre* (2020) 44:75
https://doi.org/10.1186/s42269-020-00290-3

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REVIEW Open Acc

Potential agricultural and environmental benefits of mulches—a review

Rashid Iqbal[1], Muhammad Aown Sammar Raza[1*], Mohammad Valipour[2], Muhammad Farrukh Saleem[3], Muhammad Saqlain Zaheer[1], Salman Ahmad[1], Monika Toleikiene[4], Imran Haider[1], Muhammad Usman Aslam[1] and Muhammad Adnan Nazar[1]

Abstract

Rapid industrialization and urbanization have resulted in elevated global temperature over the years consequently disturbing the balance of agro-ecological systems worldwide. Therefore, new eco-friendly agricultural practices for sustainable food production are needed. Mulching could potentially serve the purpose by reducing soil evaporation, conserving moisture, controlling soil temperature, reducing weed growth, and improving microbial


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No Dig
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No-Dig Gardening for Beginners: Step-by-Step Guide with Cardboard and Compost
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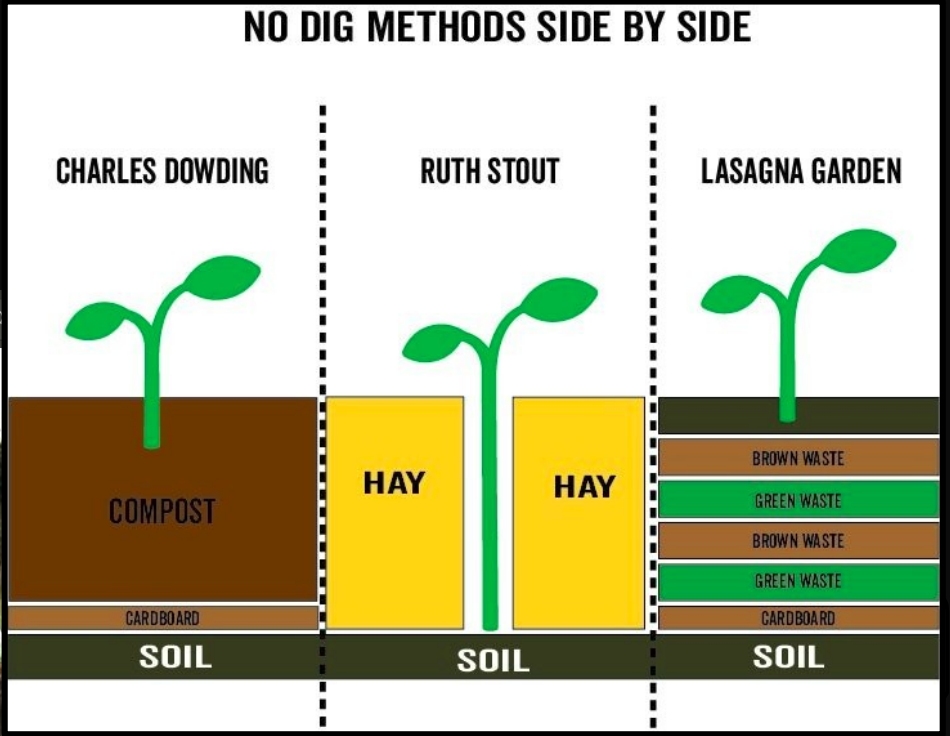
NO DIG METHODS SIDE BY SIDE
CHARLES DOWDING
RUTH STOUT
LASAGNA GARDEN
COMPOST
CARDBOARD
SOIL
HAY
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BROWN WASTE
GREEN WASTE
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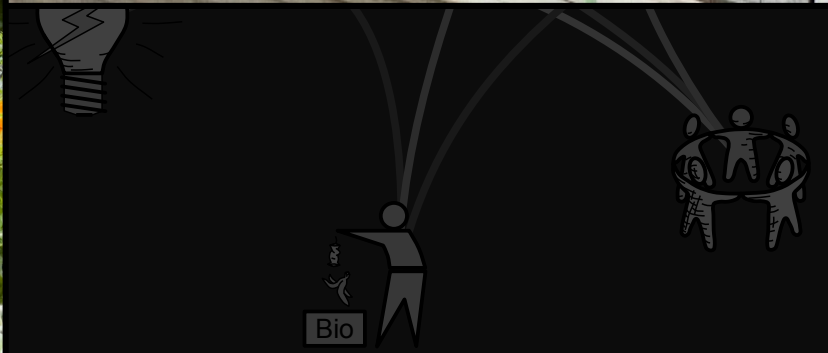
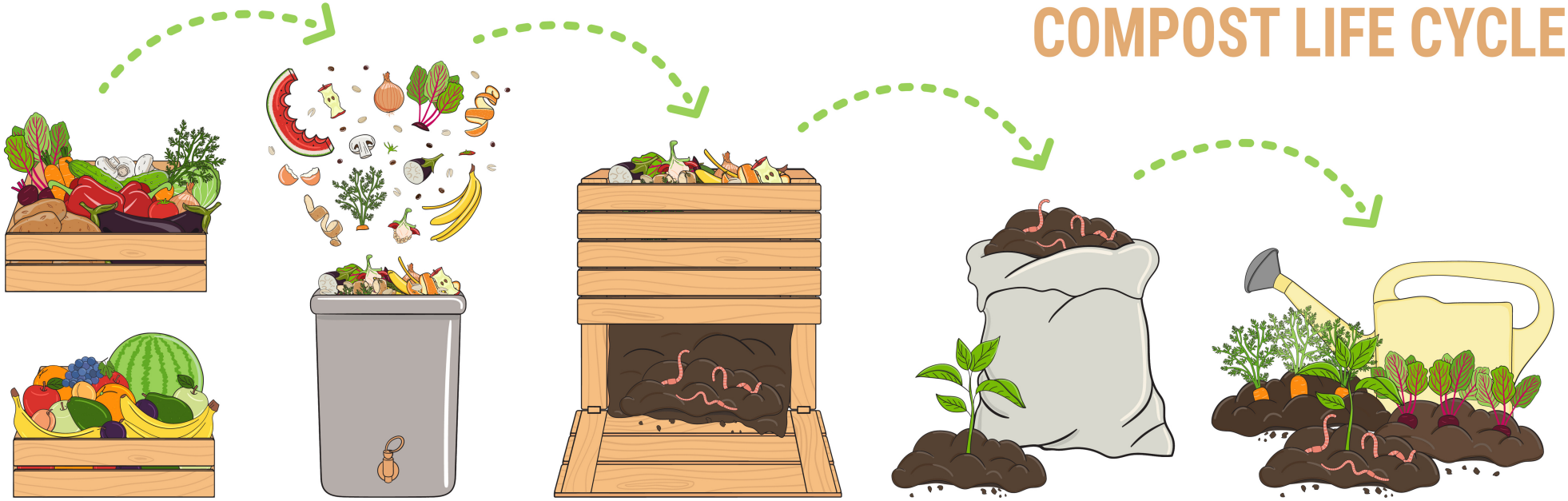
GREEN WASTE
CARDBOARD
SOIL


Bio


Bio

COMPOST LIFE CYCLE



Soil Testing

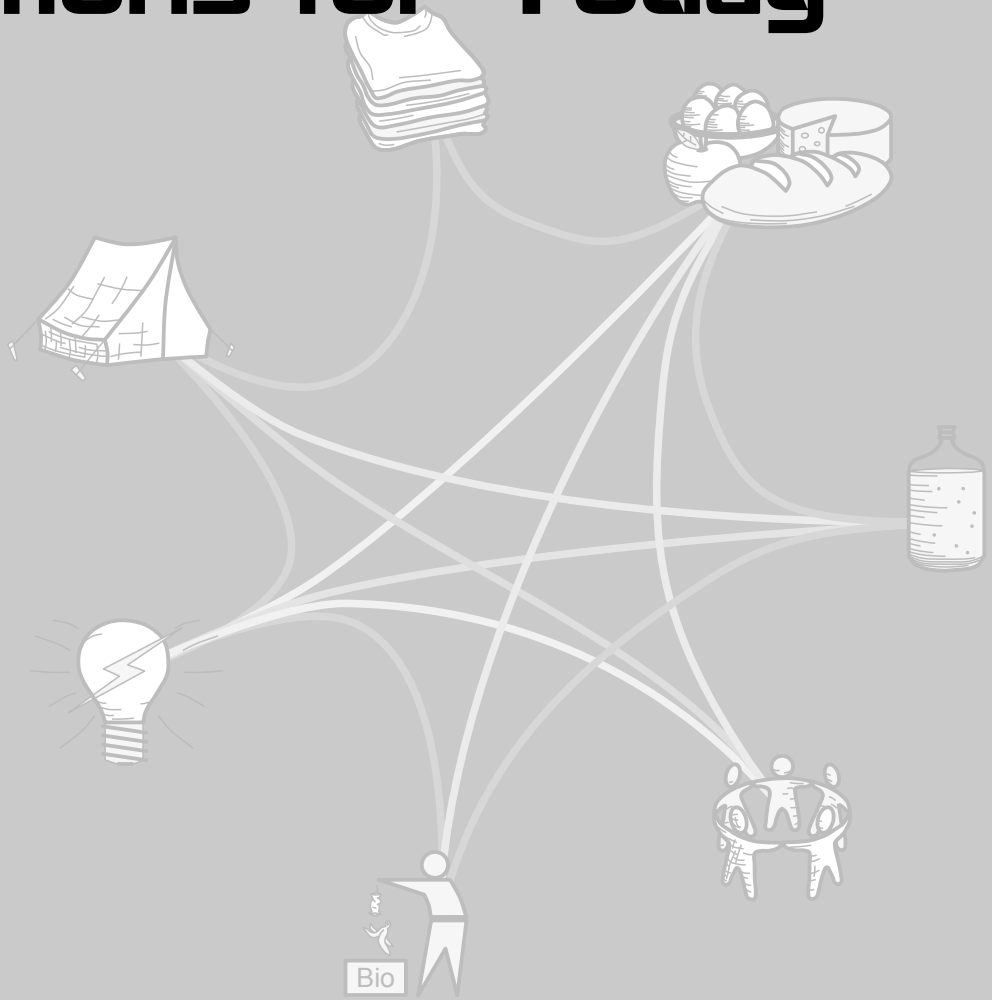
Visit the **UW Soil and Forage Lab** for information about and instructions for sampling soil for soil testing. The links below are found on their website but listed here for your convenience.

Submission Form
Instructions
General Information

The University of Wisconsin Soils Lab is located in Madison. You can reach them at (608) 262-4364 or **soil-lab@mailplus.wisc.edu** to request the testing kit, which includes sampling instructions,

Methodological **Adaptations for Today**

- Improve Soil Health
- Adjust Your Calendar



Kansas City, MO

Crop	Start Seeds Indoors	Plant Seedlings or Transplants	Start Seeds Outdoors	Last Date to Plant
Arugula	❄ Feb 13-27 ☾ Feb 13-24	❄ Mar 20-Apr 3 ☾ Mar 20-25	❄ Mar 13-20 ☾ Mar 13-20	Oct 1
Asparagus	N/A	N/A	❄ Mar 27-Apr 10 ☾ Mar 27-Apr 7	Apr 10
Basil	❄ Feb 27-Mar 13	❄ Apr 24-May 8 ☾ May 7- 8	❄ Apr 24-May 8 ☾ May 7- 8	Sep 17
Beets	N/A	❄ Mar 27-Apr 10 ☾ Mar 27-Apr 7	❄ Mar 13-20	Apr 24
Bell Peppers	❄ Jan 30-Feb 13 ☾ Feb 9-13	❄ Apr 24-May 1	N/A	Aug 6
Bok Choy	❄ Feb 27-Mar 13	❄ Apr 24-May 1	❄ Apr 24-May 1	May 22
Broccoli	❄ Feb 13-27 ☾ Feb 13-24	❄ Mar 27-Apr 10 ☾ Apr 8-10	❄ Mar 13-20 ☾ Mar 13-20	Aug 27

Madison, WI

Crop	Start Seeds Indoors	Plant Seedlings or Transplants	Start Seeds Outdoors	Last Date to Plant
Arugula	❄ Mar 12-26 ☾ Mar 12-25	❄ Apr 16-30 ☾ Apr 16-23	❄ Apr 9-16 ☾ Apr 9-16	Sep 5
Asparagus	N/A	N/A	❄ Apr 23-May 7 ☾ Apr 24-May 6	May 7
Basil	❄ Mar 26-Apr 9 ☾ Apr 8- 9	❄ May 21-Jun 4 ☾ May 21-23	❄ May 21-Jun 4 ☾ May 21-23	Aug 22
Beets	N/A	❄ Apr 23-May 7 ☾ Apr 24-May 6	❄ Apr 9-16	May 21
Bell Peppers	❄ Feb 26-Mar 12	❄ May 21-28 ☾ May 21-23	N/A	Jul 11
Bok Choy	❄ Mar 26-Apr 9 ☾ Apr 8- 9	❄ May 21-28 ☾ May 21-23	❄ May 21-28 ☾ May 21-23	Jun 18

Kansas City, MO

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Basil	❄ Feb 27-Mar 13	❄ Apr 24-May 8 ☾ May 7- 8	❄ Apr 24-May 8 ☾ May 7- 8	Sep 17
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60 Years of Change

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60 Years of Change

Trends in Plant Science

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The Hidden Costs of Nighttime Warming on Yields

Walid Sadok [3] • S.V. Krishna Jagadish [4] • Show footnotes

Open Access • Published: March 10, 2020 • DOI: https://doi.org/10.1016/j.tplants.2020.02.003 • Check for updates

PlumX Metrics

Highlights

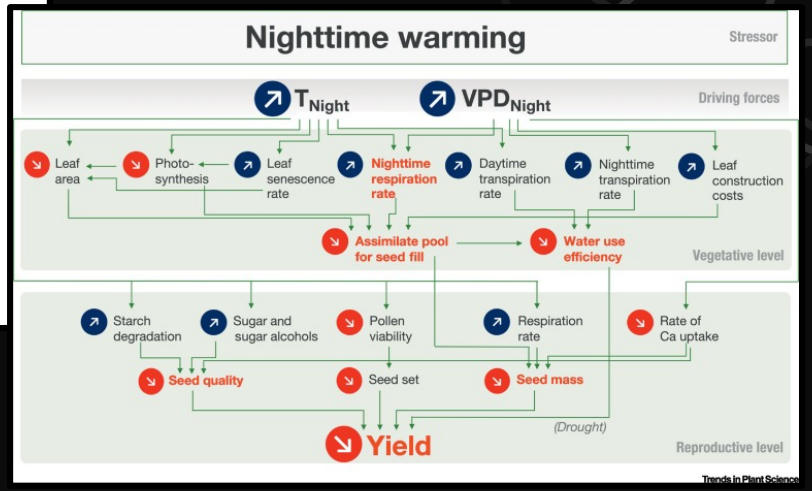
Nighttime warming is reducing crop yields worldwide, threatening global food security.

This phenomenon is more complex than may be assumed, likely to involve interaction between two driving forces: nighttime temperature and evaporative demand.

The two conspire to limit carbon availability for yield and end-use quality traits while decreasing water use efficiency, potentially enhancing vulnerability to droughts.

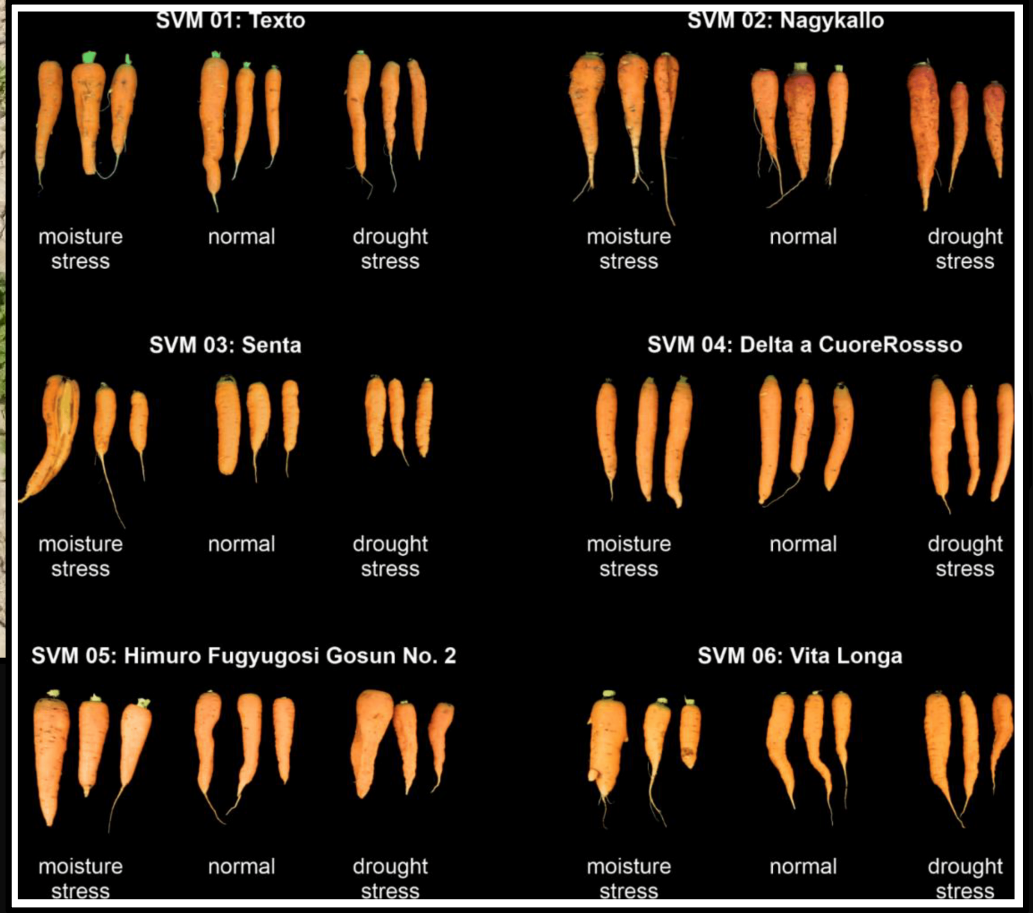
An ecophysiological framework is proposed as a guide to implement future research efforts to mitigate yield declines.

Such efforts should integrate physiology with crop modeling, breeding, and management to identify sustainable pathways for mitigation as climate change intensifies.




Bio

Bio


SVM 01: Texto
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drought stress
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normal
drought stress
SVM 04: Delta a CuoreRossso
moisture stress
normal
drought stress
SVM 05: Himuro Fugyugosi Gosun No. 2
moisture stress
normal
drought stress
SVM 06: Vita Longa
moisture stress
normal
drought stress

genes

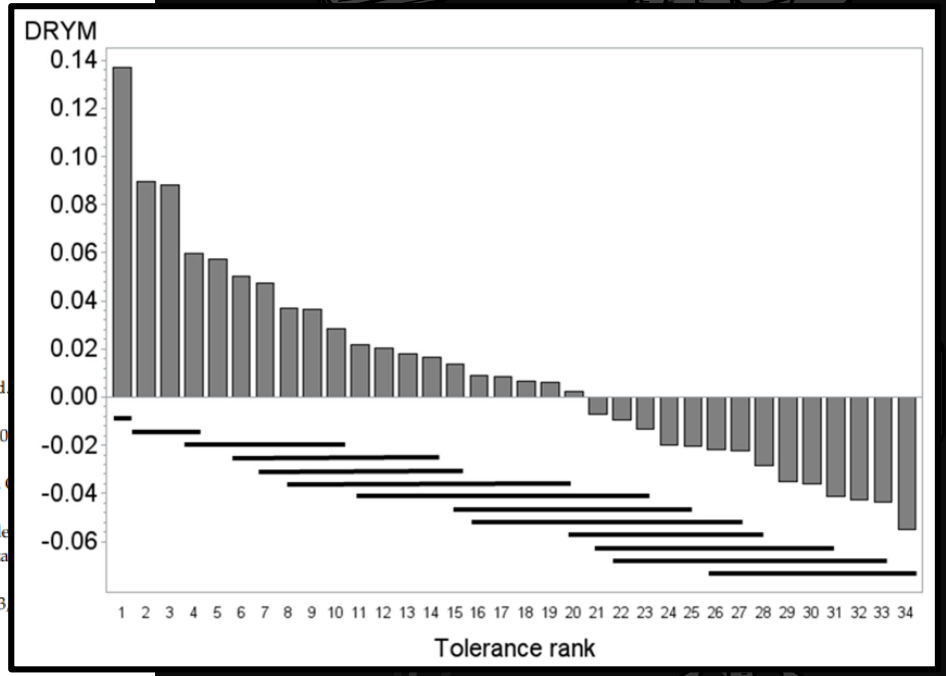
MDPI

Article

Unravelling Differences in Candidate Genes for Drought Tolerance in Potato (*Solanum tuberosum* L.) by Use of New Functional Microsatellite Markers

Christina Schumacher [1], Christoph Tim Krannich [1], Lisa Maletzki [1], Karin Köhl [2], Joachim Kopka [2], Heike Sprenger [2,3], Dirk Karl Hincha [4], Sylvia Seddig [5], Rolf Peters [6,7], Sadia Hamera [1], Ellen Zuther [2], Manuela Haas [2,8] and Renate Horn [1,*]

1 Institute of Biological Sciences, Plant Genetics, University of Rostock, Albert-Einstein-Str. 3, 18059 Rostock, Germany; christina.schumacher2017@outlook.com (C.S.); christoph.krannich@gmx.de (C.T.K.); lisa.maletzki@uni-greifswald.de (L.M.); sadia.hamera@uni-rostock.de (S.H.)
2 MPI für Molekulare Pflanzenphysiologie, Am Mühlenberg 1, 14476 Potsdam, Germany; koehl@mpimp-golm.mpg.de (K.K.); kopka@mpimp-golm.mpg.de (J.K.); Heike.Sprenger@bfr.bund. Zuther@mpimp-golm.mpg.de (E.Z.); manuela.haas@mluk.brandenburg.de (M.H.)
3 Department of Food Safety, German Federal Institute for Risk Assessment, Max-Dohrn Straße 8-10 10589 Berlin, Germany
4 Deceased, Formerly MPI für Molekulare Pflanzenphysiologie, Am Mühlenberg 1, 14476 Potsdam, Hincha@mpimp-golm.mpg.de
5 Julius Kühn-Institut, Rudolf-Schick-Platz 3, 18190 Sanitz, Germany; sylvia.seddig@julius-kuehn.de
6 Landwirtschaftskammer Niedersachsen, Dethlingen 14, 29633 Munster, Germany; peters@docpota
7 PotatoConsult UG, Hiddinger Straße 33, 27374 Visselhövede, Germany
8 Ministry of Agriculture, Environment and Climate Protection, Henning-Von-Tresckow-Straße 2-13, 14467 Potsdam, Germany
* Correspondence: renate.horn@uni-rostock.de; Tel.: +49-381-498-6170



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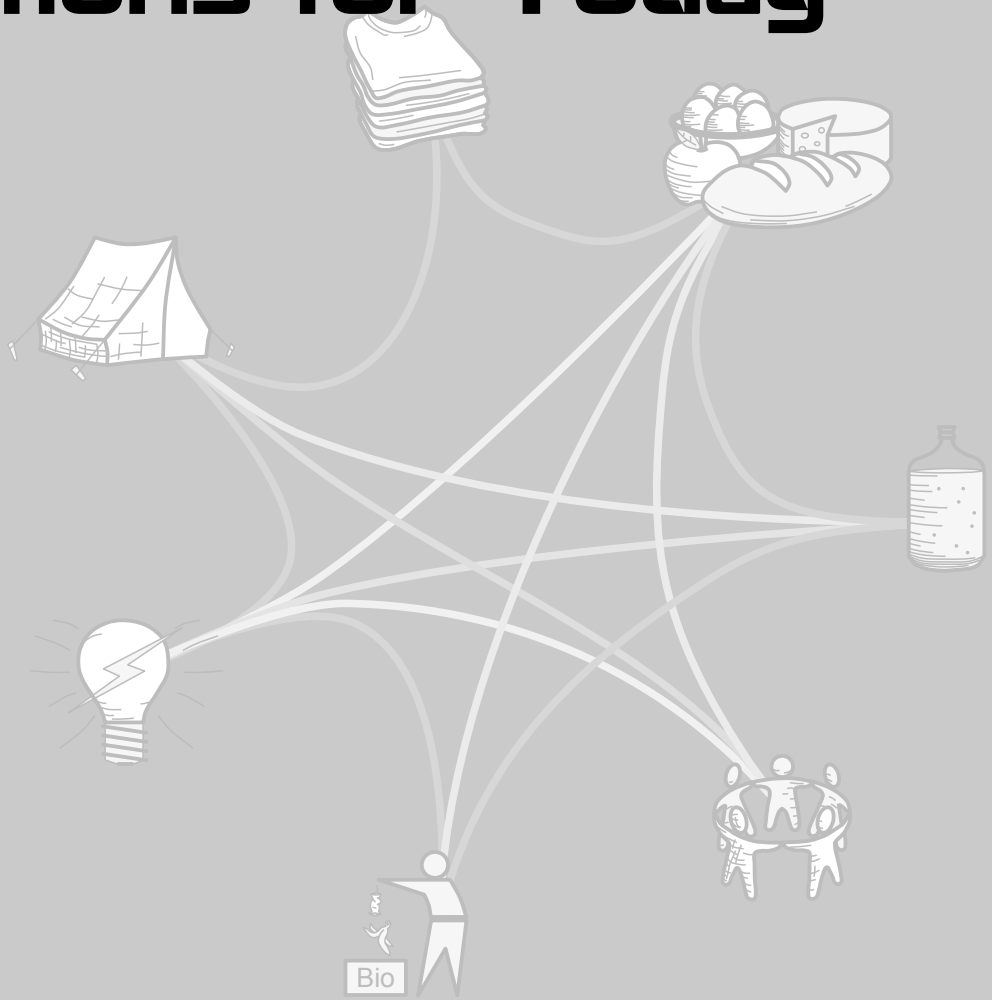
Citation: Schumacher, C.; Krannich, C.T.; Maletzki, L.; Köhl, K.; Kopka, J.; Sprenger, H.; Hincha, D.K.; Seddig, S.; Peters, R.; Hamera, S.; et al. Unravelling Differences in Candidate Genes for Drought Tolerance in Potato (*Solanum tuberosum* L.) by Use of New Functional Microsatellite Markers. *Genes* **2021**, *12*, 494. https://doi.org/10.3390/genes12040494

Academic Editor: Pietro Gramazio

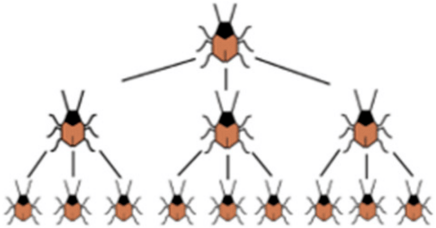
Abstract: Potato is regarded as drought sensitive and most vulnerable to climate changes. Its cultivation in drought prone regions or under conditions of more frequent drought periods, especially in subtropical areas, requires intensive research to improve drought tolerance in order to guarantee high yields under limited water supplies. A candidate gene approach was used to develop functional simple sequence repeat (SSR) markers for association studies in potato with the aim to enhance breeding for drought tolerance. SSR primer combinations, mostly surrounding interrupted complex and compound repeats, were derived from 103 candidate genes for drought tolerance. Validation

Methodological **Adaptations for Today**

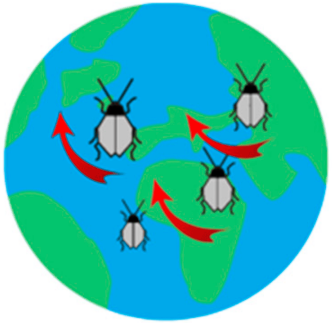
- Improve Soil Health
- Adjust Your Calendar
- Bug Aware!



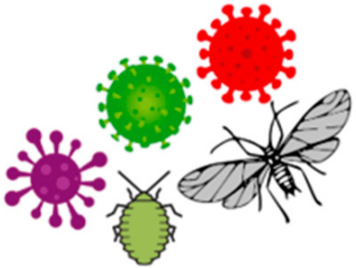
HOW DOES TEMPERATURE INCREASE AFFECTS INSECT PESTS?



Increased number of generations

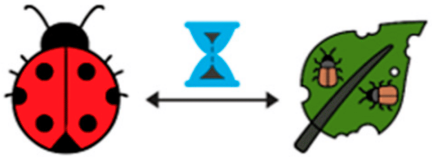


Expansion of geographic range



Outbreak of plant diseases transmitted by insects

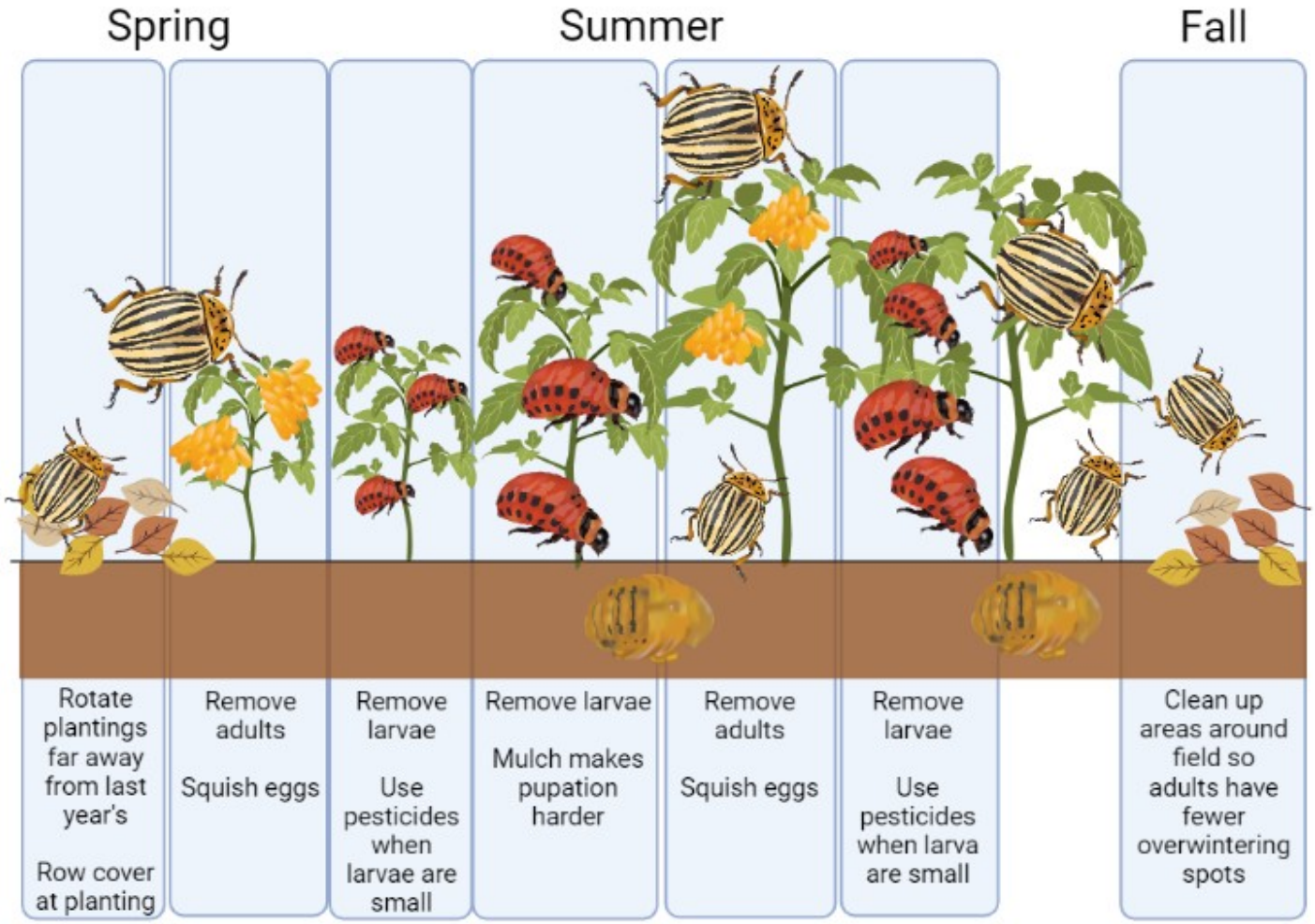
Increased overwintering survival



Desynchronization of insects and their natural enemies

Loss of synchrony with the host plant

Managing Colorado Potato Beetle



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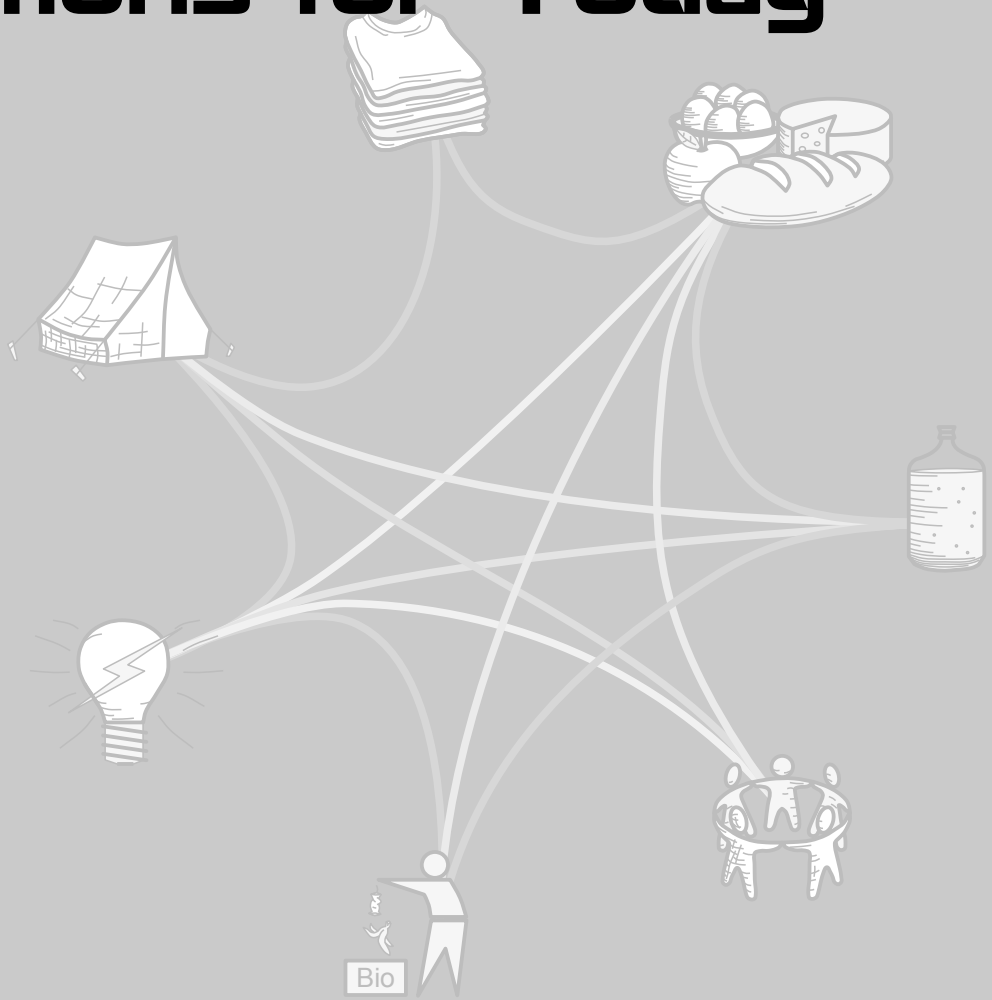
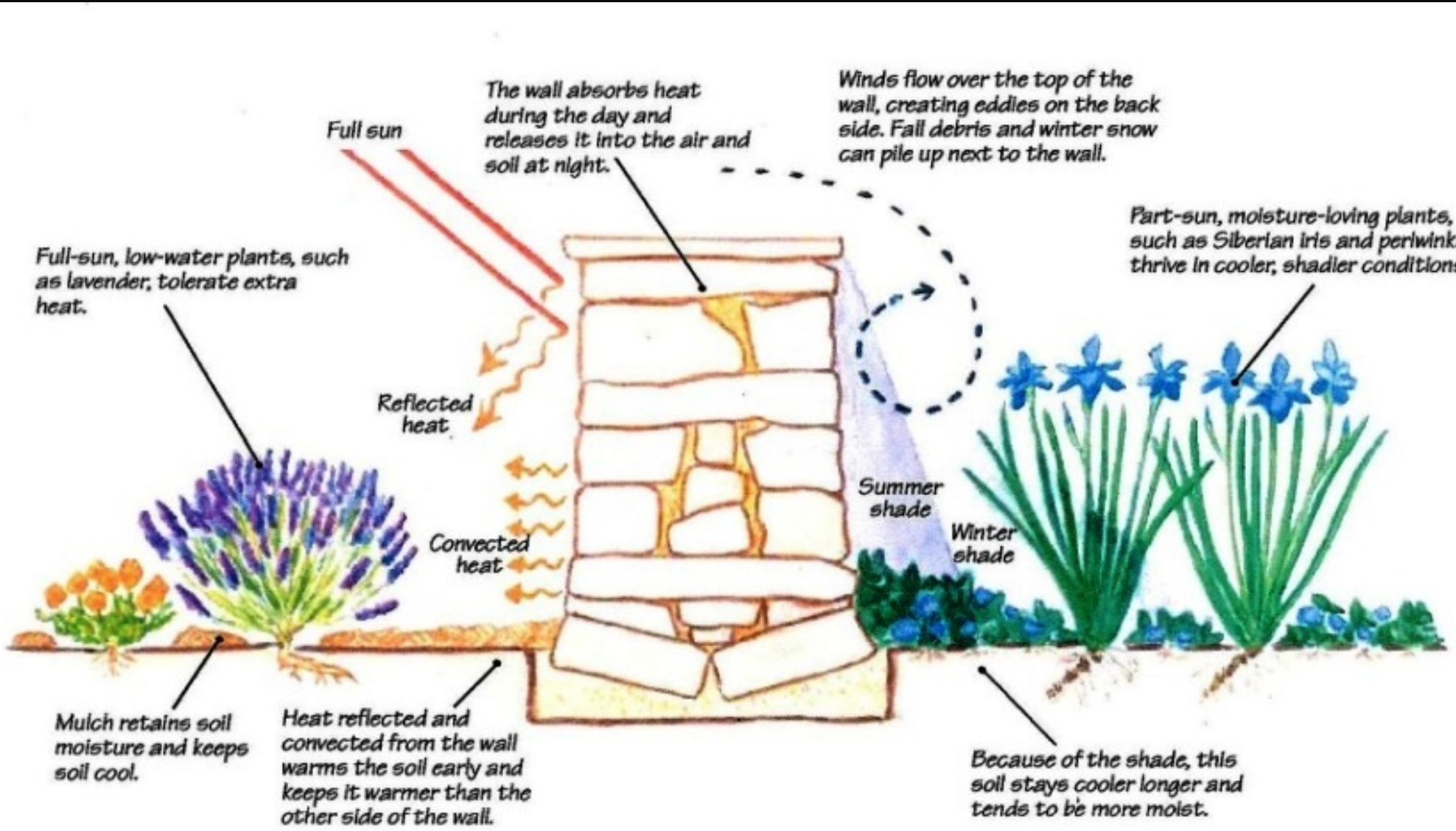
- MicroZones

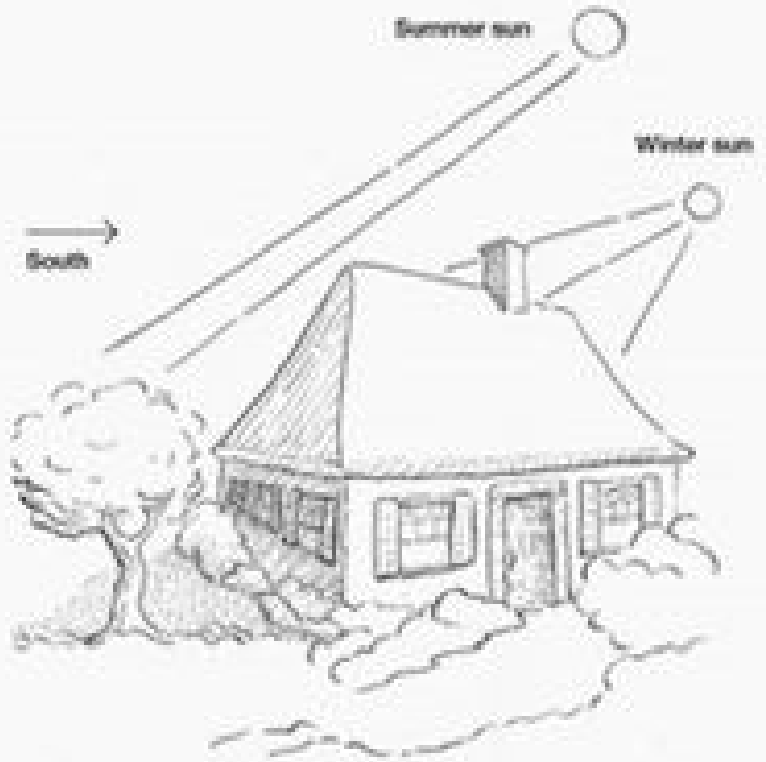


LASER ZONE

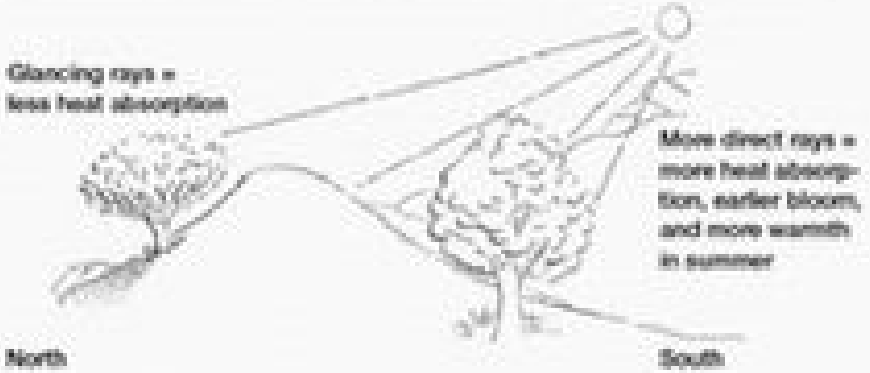

Full sun
The wall absorbs heat during the day and releases it into the air and soil at night.
Winds flow over the top of the wall, creating eddies on the back side. Fall debris and winter snow can pile up next to the wall.
Part-sun, moisture-loving plants, such as Siberian iris and periwinkle, thrive in cooler, shadier conditions.
Full-sun, low-water plants, such as lavender, tolerate extra heat.
Reflected heat
Convected heat
Summer shade
Winter shade
Mulch retains soil moisture and keeps soil cool.
Heat reflected and convected from the wall warms the soil early and keeps it warmer than the other side of the wall.
Because of the shade, this soil stays cooler longer and tends to be more moist.

Working with Microclimates

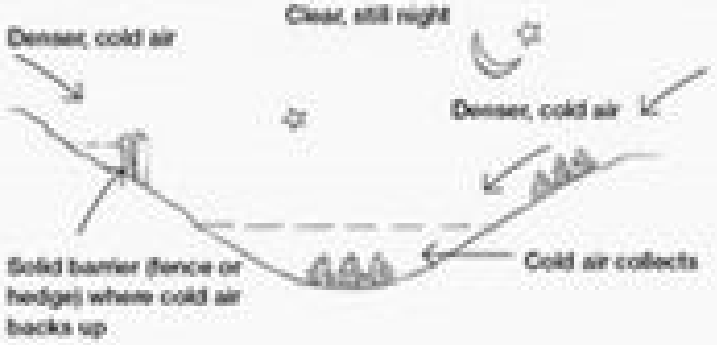
PLANT ON NORTH SIDE OF BUILDING

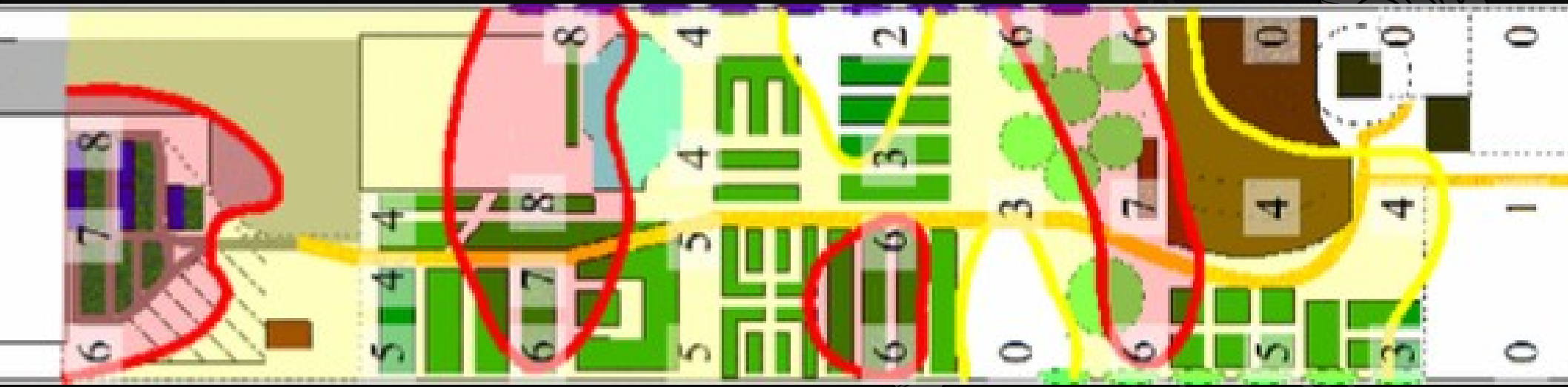


PLANT ON NORTH AND SOUTH SIDES OF SLOPES



COLD POCKET




Bio

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- Weeding

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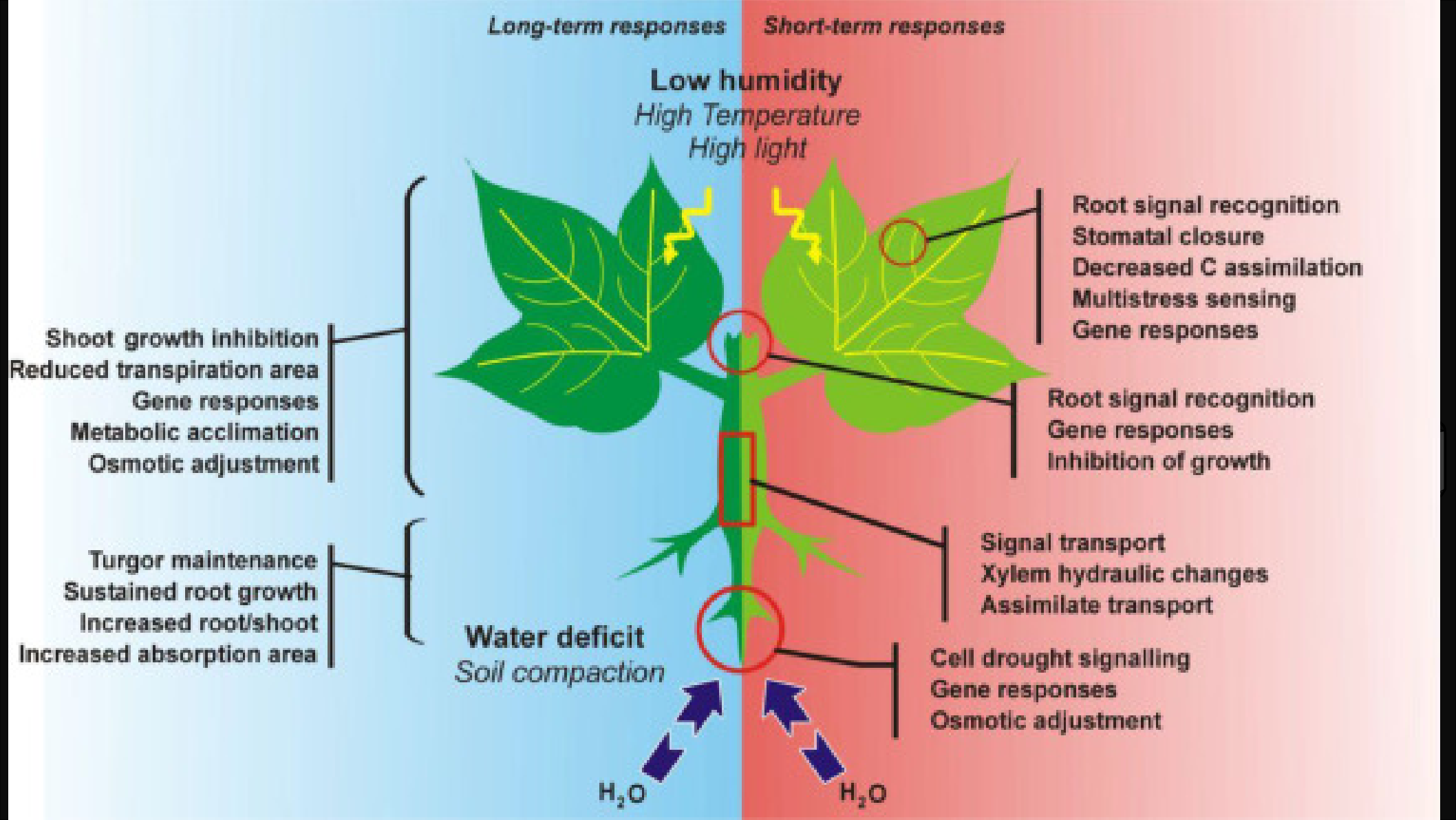
- Weeding
- Irrigation


Long-term responses
Short-term responses
Low humidity
High Temperature
High light
Root signal recognition
Stomatal closure
Decreased C assimilation
Multistress sensing
Gene responses
Shoot growth inhibition
Reduced transpiration area
Gene responses
Metabolic acclimation
Osmotic adjustment
Root signal recognition
Gene responses
Inhibition of growth
Signal transport
Xylem hydraulic changes
Assimilate transport
Turgor maintenance
Sustained root growth
Increased root/shoot
Increased absorption area
Water deficit
Soil compaction
Cell drought signalling
Gene responses
Osmotic adjustment
H2O
H2O

HOW OFTEN DO YOU NEED TO WATER YOUR GARDEN?

Plant	When to Water	Gallons Needed
Bell Peppers	Steady watering from flowering through to harvest time	2 per week
Cucumber	Frequently during flower and vegetable development	1 per week
Tomato	During the first month after transplanting, and when flowers/fruit form	>1, twice per week
Zucchini	Frequently, at all stages of growth	1 per week
Corn	When tassels form on cobs, and cobs begin to swell	2 at each stage listed
Basil	Regularly, keeping soil moist	Wate... neede...
Kale	Regularly, keeping soil moist	Water as needed
Potatoes	As soon as potatoes begin to form, and again when they are the size of marbles	2 per week
Peas	When flowers form, during pod formation, and during picking	2 per week
Carrots	During root development, and again before soil is completely dry	1 during root development, then 2 every 2 weeks
Lettuce	Water frequently at all stages of growth	2 per week
Onions	Infrequently under normal conditions, or during early stages during dry weather	1/2 - 1 per week if soil is dry

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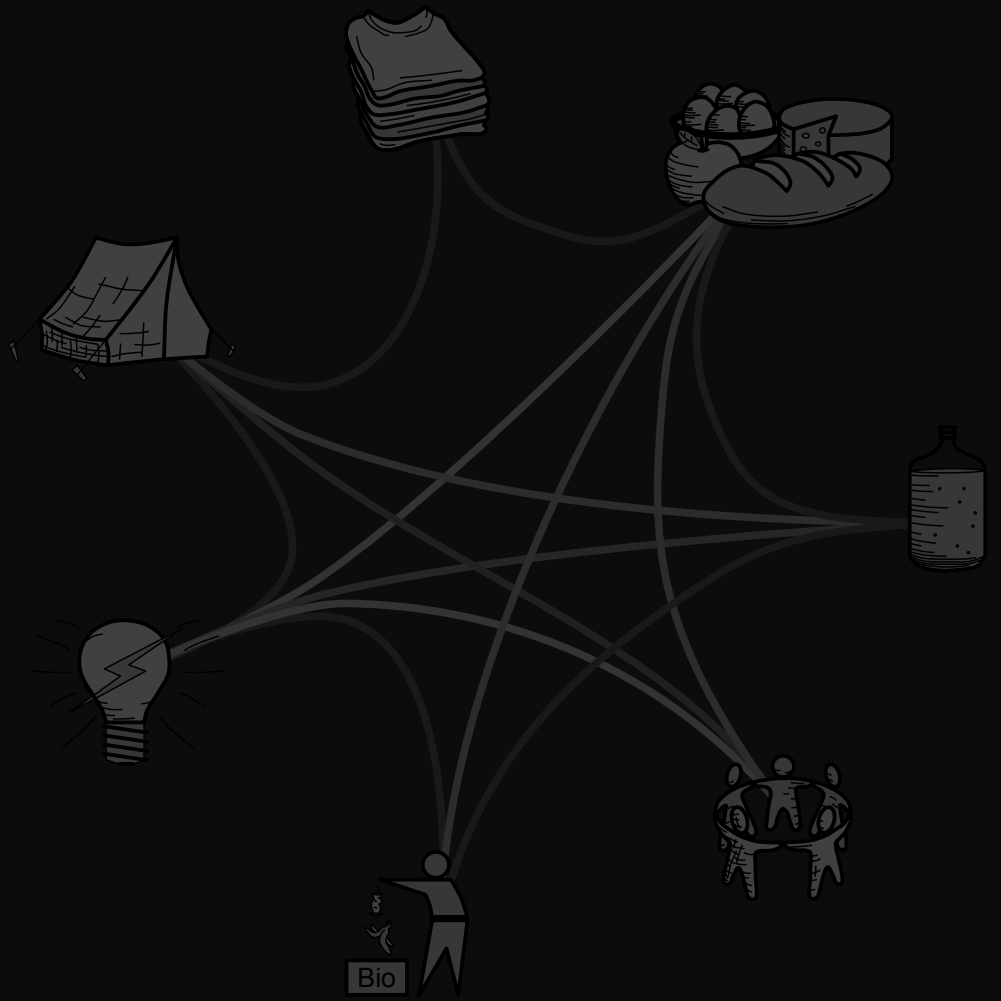
VS



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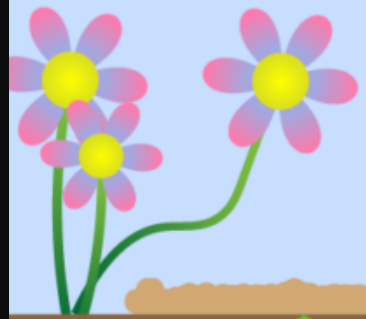
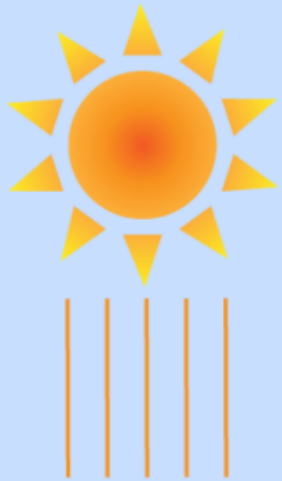
VS

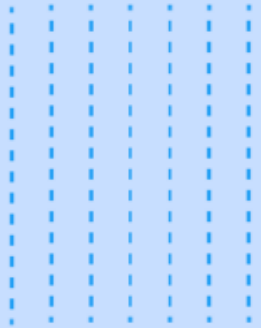
GARDEN WATERING SCHEDULE

Twice a Week	Once a Week	10 Days to 2 Weeks
Lettuce		
Celery		Tomatoes
Spinach	Beans	Watermelons
Swiss chard	Corn	Cantaloupes
Radishes	Peppers	Butternut Squash
Beets	Eggplant	Hubbard Squash
Carrots	Zucchini	Banana Squash
Turnips	Summer Squash	Peaches
Potatoes	Cucumbers	Nectarines
Broccoli	Yams	Pears
Cauliflower	Peanuts	Apples
Cabbage	Rhubarb	Plums
Strawberries	Onions	Cherries
Raspberries	Pumpkins	Grapes
Blackberries		Asparagus
Peas		

Benefits of Using Mulch







2" to 3" of Mulch

Nourishes Soil

As ORGANIC mulch decomposes, it nourishes your soil and feeds your plants. This happens over time.

Suppresses Weeds

Mulch cuts weed seeds off from sunlight. This prevents them from growing enough to break through the surface.

Conserves Water

Mulch helps soil retain moisture. This lowers the amount of watering needed in your plant bed.

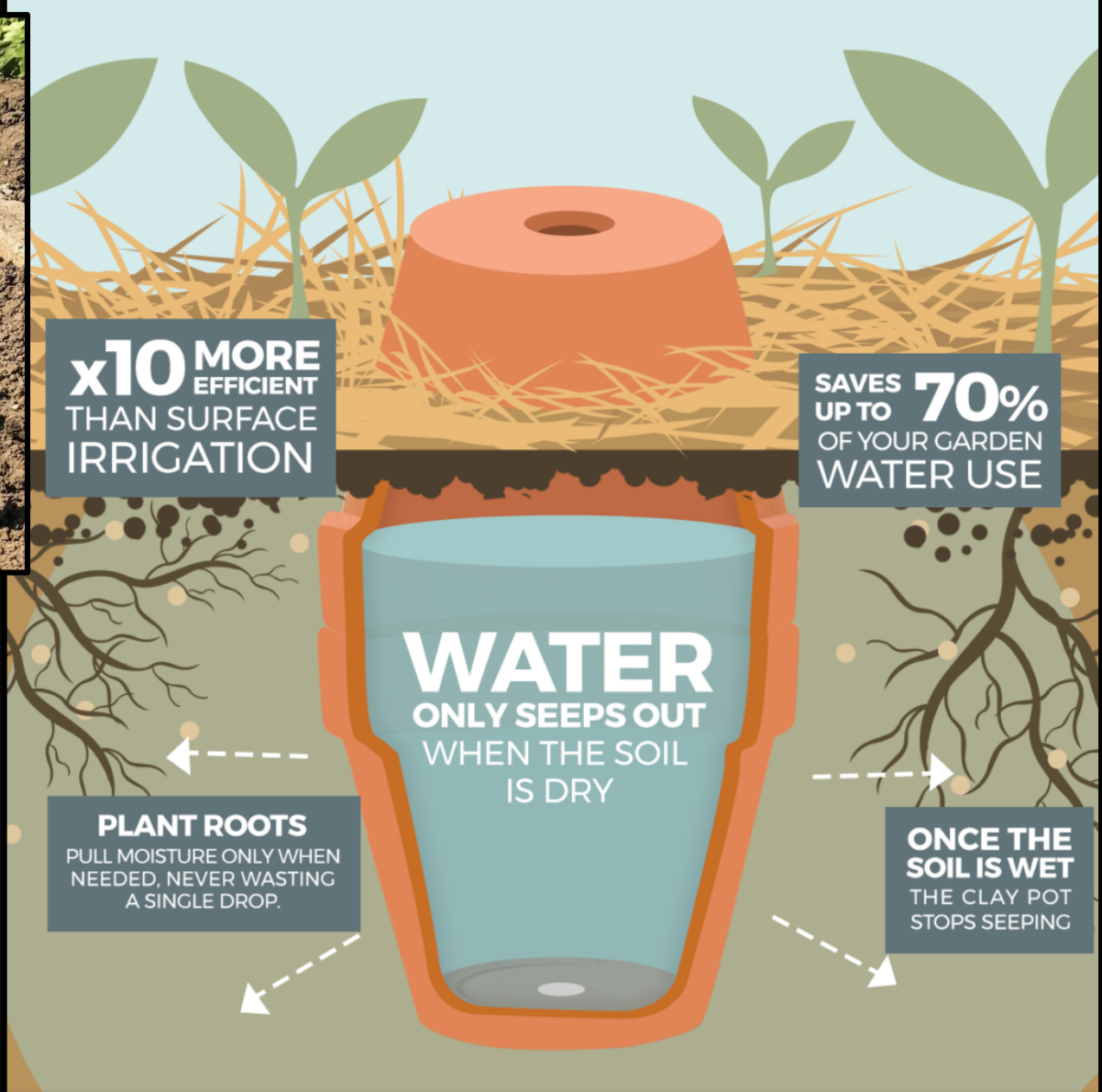
Regulates Temperature

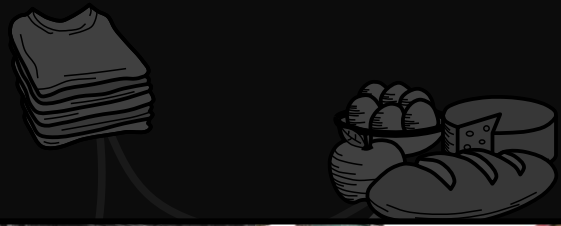
Mulch insulates your plants' root systems against the sun and extreme temperature variations.

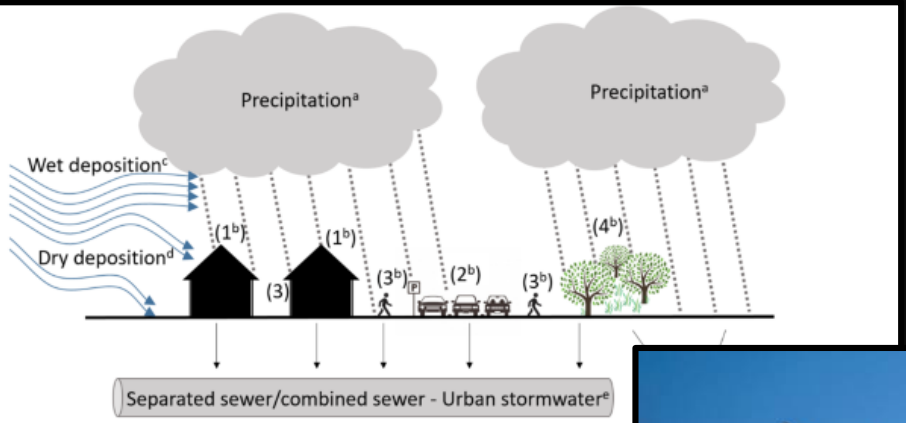
Prevents Erosion

Mulch acts as the first defense against nature's elements that threaten to wear away your soil.

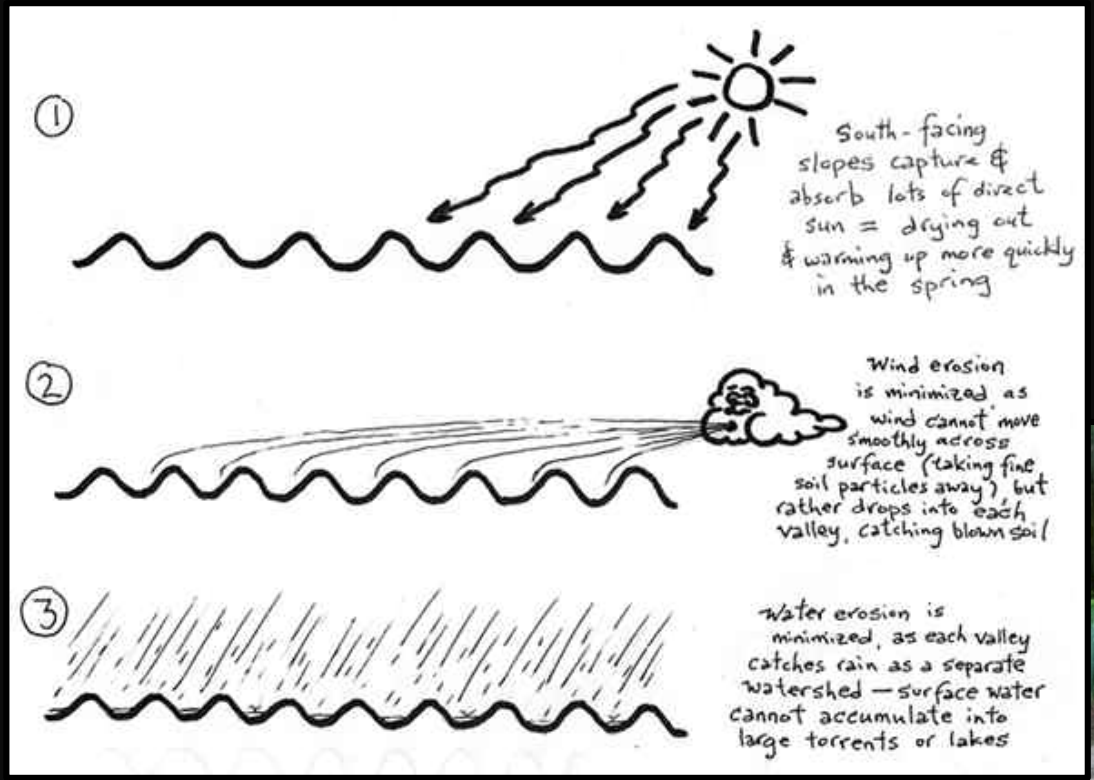

Garden Drip Hose


x10 MORE EFFICIENT
THAN SURFACE
IRRIGATION
SAVES UP TO 70%
OF YOUR GARDEN
WATER USE
WATER
ONLY SEEPS OUT
WHEN THE SOIL
IS DRY
PLANT ROOTS
PULL MOISTURE ONLY WHEN NEEDED, NEVER WASTING A SINGLE DROP.
ONCE THE SOIL IS WET
THE CLAY POT STOPS SEEPING





Source of runoff contamination	(1) Roof	(2) Vehicle related surface	(3) Other imperme
Dry and wet atmospheric deposition[c]	Combustion processes - vehicle exhaust - industry – agricultu		
Release from solid materials (leaching, oxidation, wearing)	Roofing materials Roofing accessories (e.g. gutters, downspout)	Road construction materials	Wall pa (e.g. biocide Other construct (e.g. bricks, p
Direct human activities	Roof maintenance and cleaning activities Removal of mosses, lichens and algae (Re)growth prevention Construction works	Tire and brake wearing Vehicle liquid spills (e.g. oil) Vehicle exhaust Fly-tipping	Use of pesticide mainter Various Fly-tip
Animal activities	Bird feces	Bird and mammal feces	Bird and mar
		Urban stormwater[e]	


①
South-facing slopes capture & absorb lots of direct sun = drying out & warming up more quickly in the spring
②
Wind erosion is minimized as wind cannot move smoothly across surface (taking fine soil particles away) but rather drops into each valley, catching blown soil
③
Water erosion is minimized, as each valley catches rain as a separate watershed — surface water cannot accumulate into large torrents or lakes

Sustainable Sanitation and Water Management Toolbox

Find tangible tools and resources to solve sanitation and water management challenges

For every challenge there is a solution

Explore different perspectives around sustainable sanitation and water management. Perspectives compile and structure the information that relate to a given focus theme, region or context.

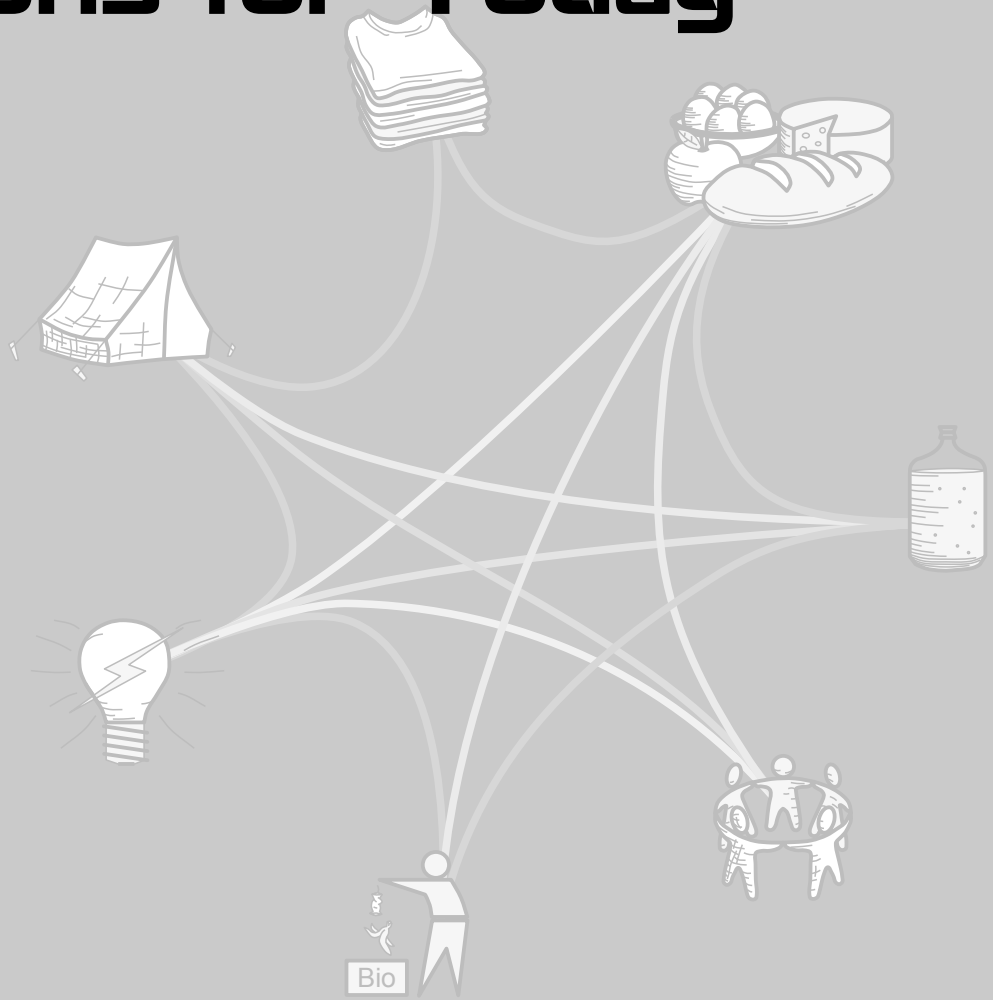
View all Perspectives

Methodological **Adaptations for Today**

- Improve Soil Health
- Adjust Your Calendar
- Bug Aware!
- MicroZones
- Weeding
- Irrigation
- Compost

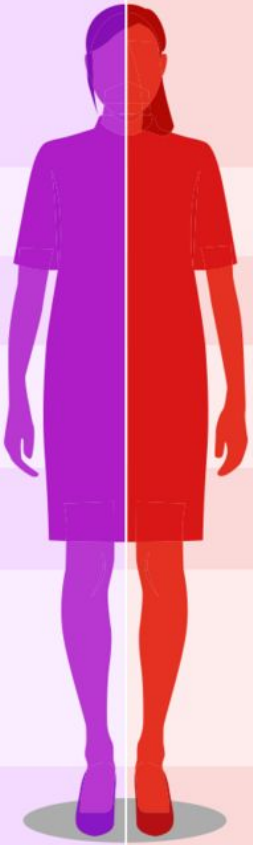
Gardener **Adaptations for Today**

- Take it Easy



Differences between heat exhaustion and heatstroke

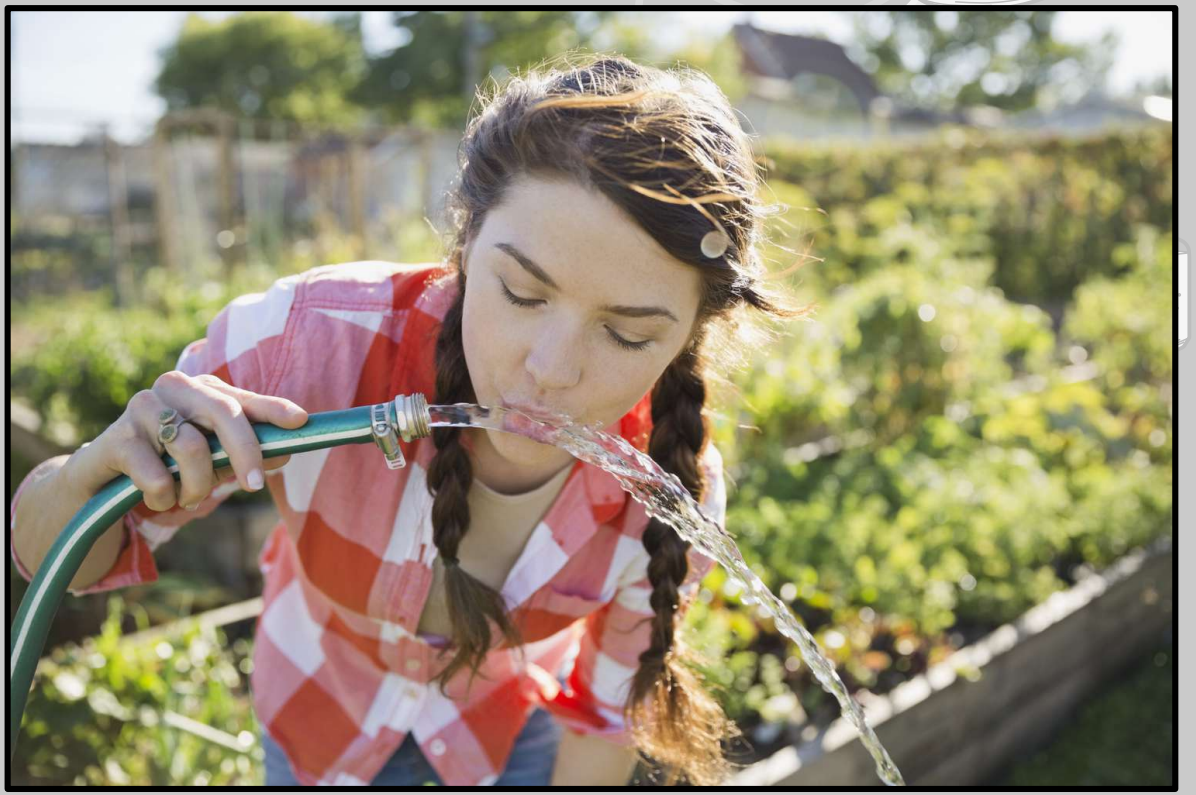
Heat exhaustion	Heatstroke
Feeling faint or dizzy	Feeling confused
Excessive sweating	No sweating
Clammy skin	Temperature over 40C, hot, dry skin
Nausea or vomiting	Nausea or vomiting
Muscle cramps	May lose consciousness or experience convulsions or seizures



Source: NHS

Gardener Adaptations for Today

- Take it Easy
- Water



Gardener **Adaptations for Today**

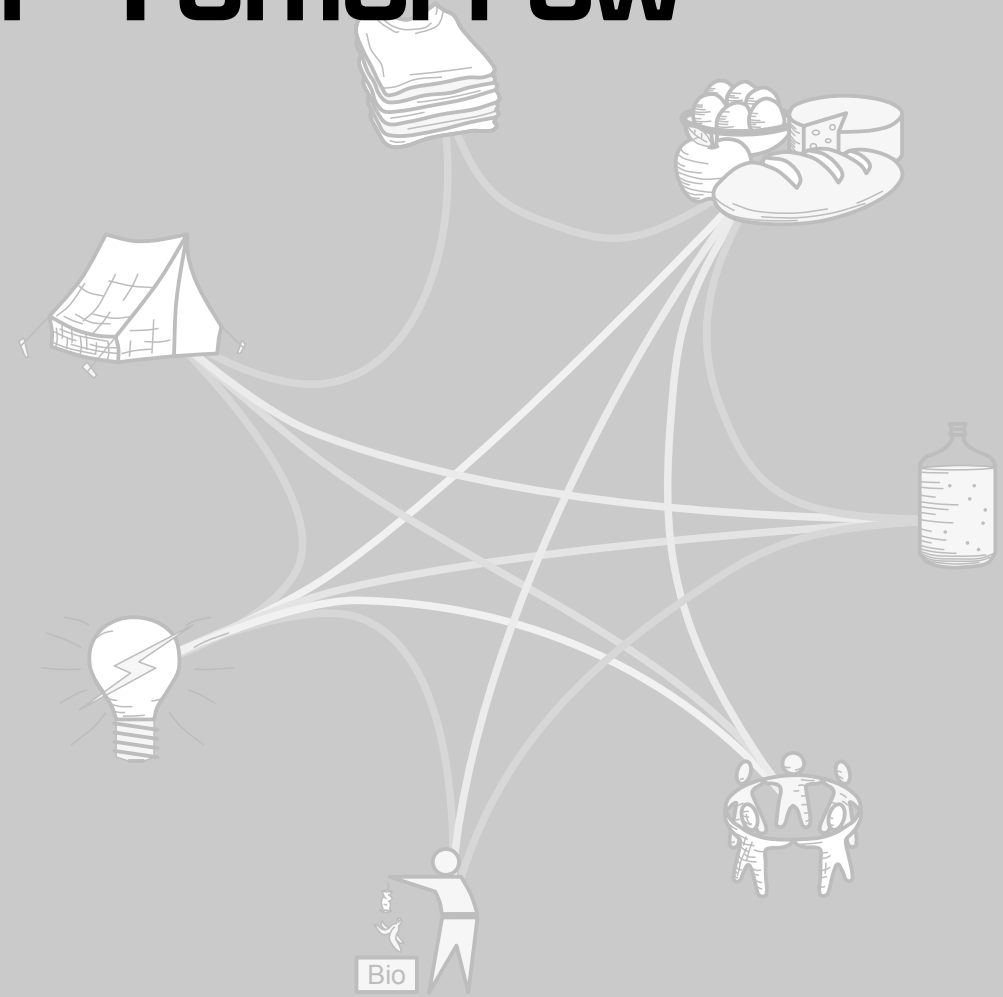
- Take it Easy
- Water
- Clothes

Gardener **Adaptations for Today**

- Take it Easy
- Water
- Clothes
- Schedule

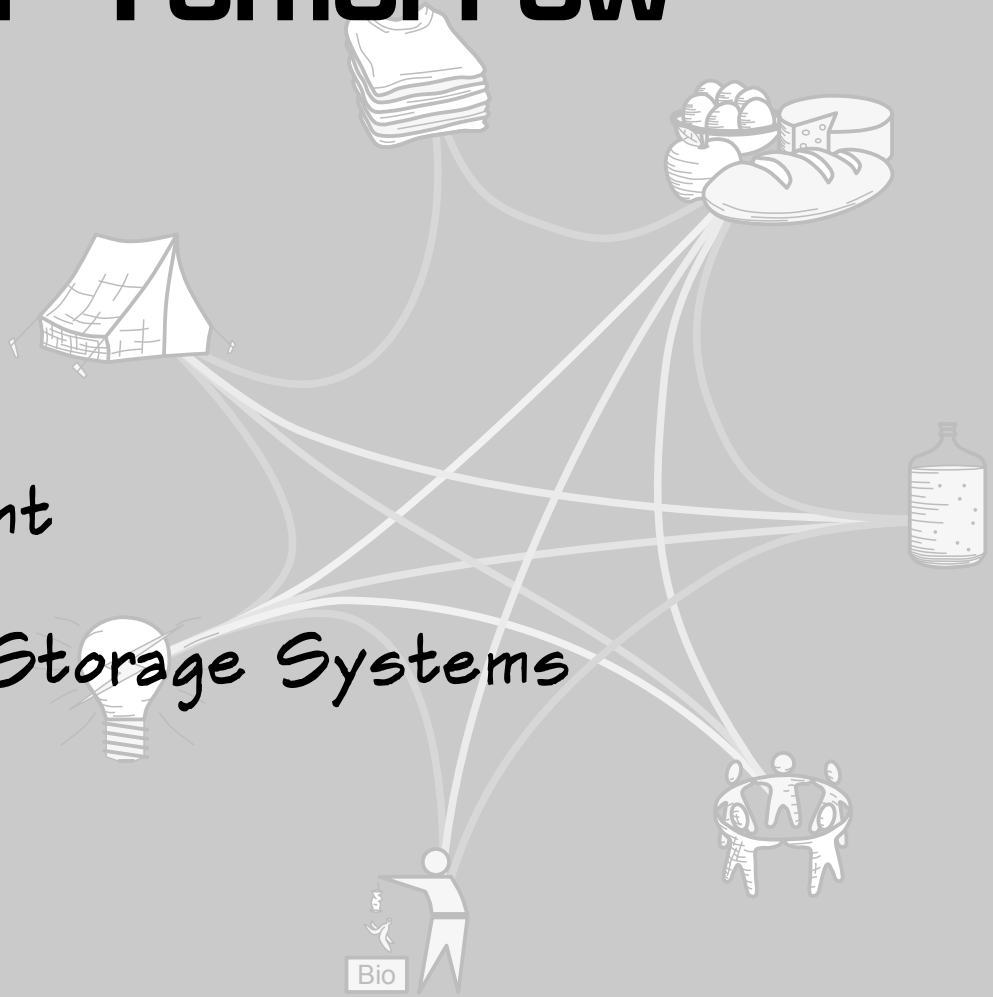
Adaptations for Tomorrow

- Botanical
  - New & Existing Varieties
  - Modify Perennials
  - Variety as Insurance



Adaptations for Tomorrow

- Botanical
- Methodological
  - Continued Soil Improvement
  - Permanent Irrigation and Storage Systems



Gardening in a Warming Wisconsin

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