Climate Change

AND VERMONT'S FOOD SYSTEM

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What Is Happening to Vermont?

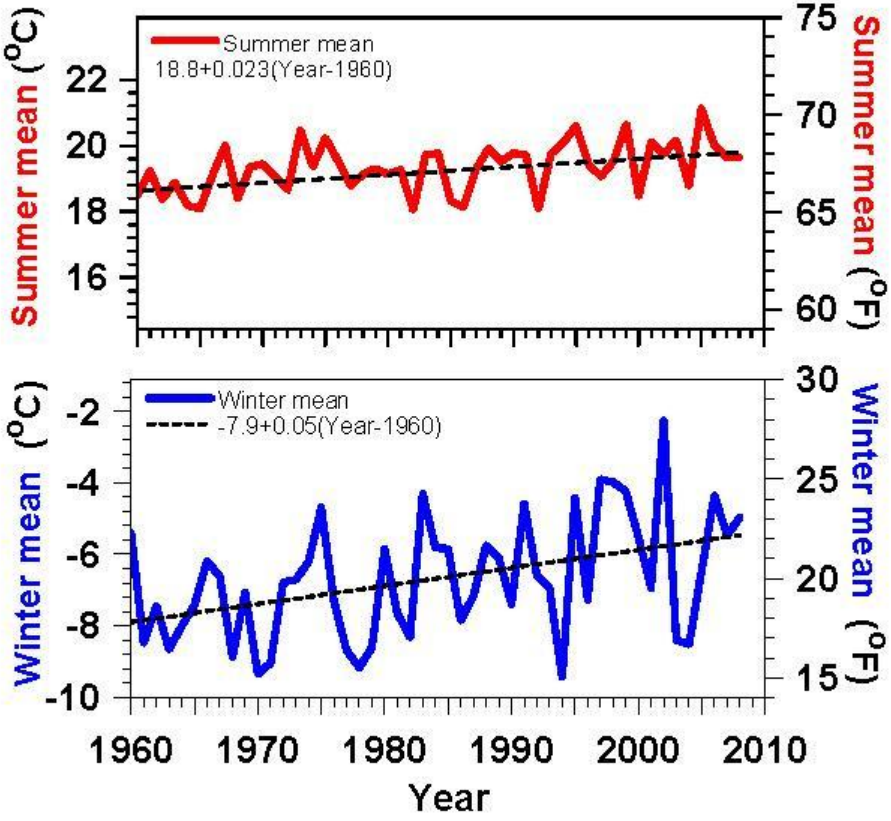
- **PAST 40/50 years** ***(global CO_2 forcing detectible)***
- **Warming twice as fast in winter than summer**
- **Winter minimums increasing even faster**
- **Lakes frozen less by 7 days / decade**
- **Growing season longer by 3-4 days / decade**
- **Spring coming earlier by 2-3 days / decade**

(Betts, 2011)

- **<u>Extreme weather increasing</u>**
- ***Evaporation increases with Temperature***
- ***More 'quasi-stationary weather patterns'***

Vermont Temperature Trends 1961-2008

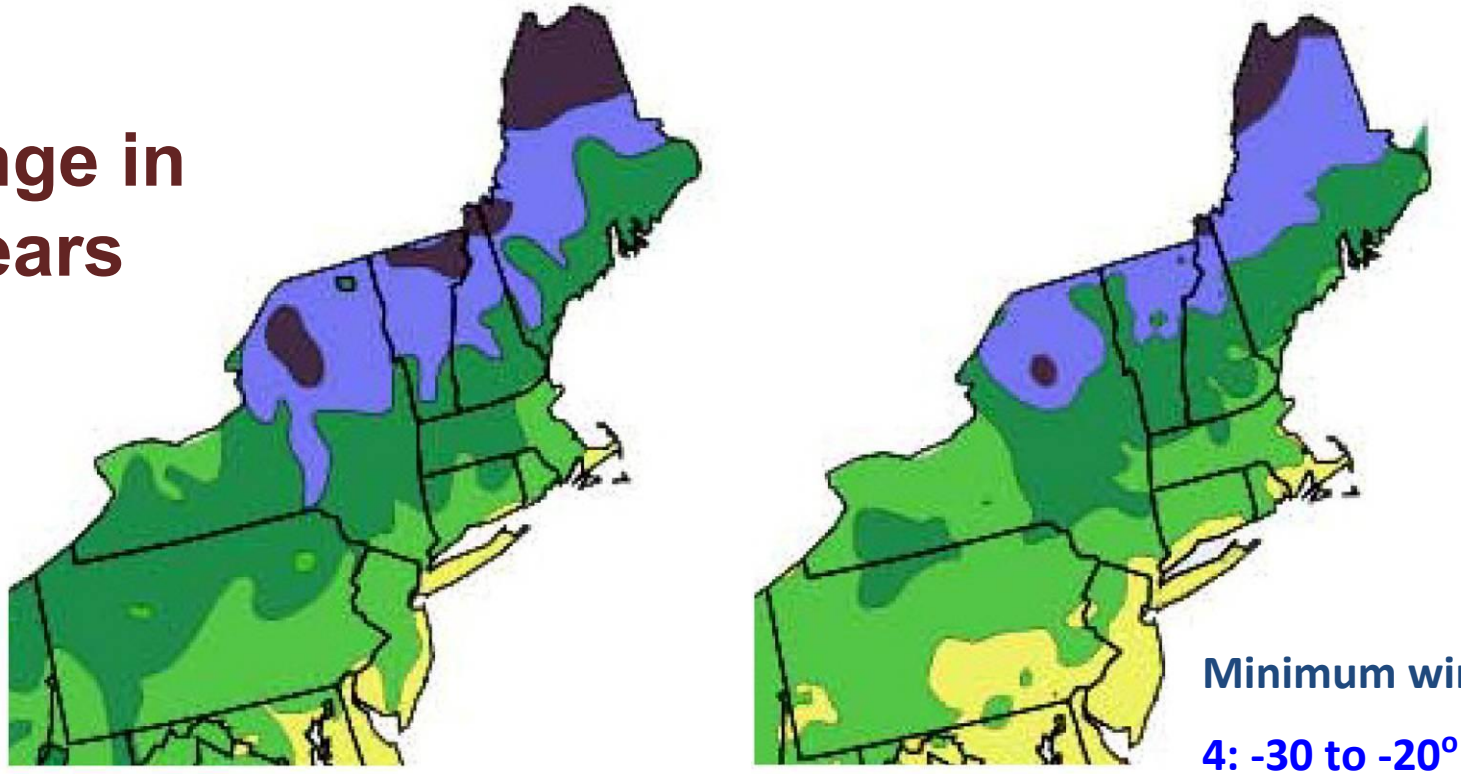
- **Summer +0.4°F / decade**
- **Winter +0.9°F / decade**
- **Larger variability, larger trend**
- ***Less snow (and increased water vapor) drive larger winter warming***



Winter Hardiness Zones

– ***winter cold extremes***

Change in 16 years



Minimum winter T

4: -30 to -20°F

5: -20 to -10°F

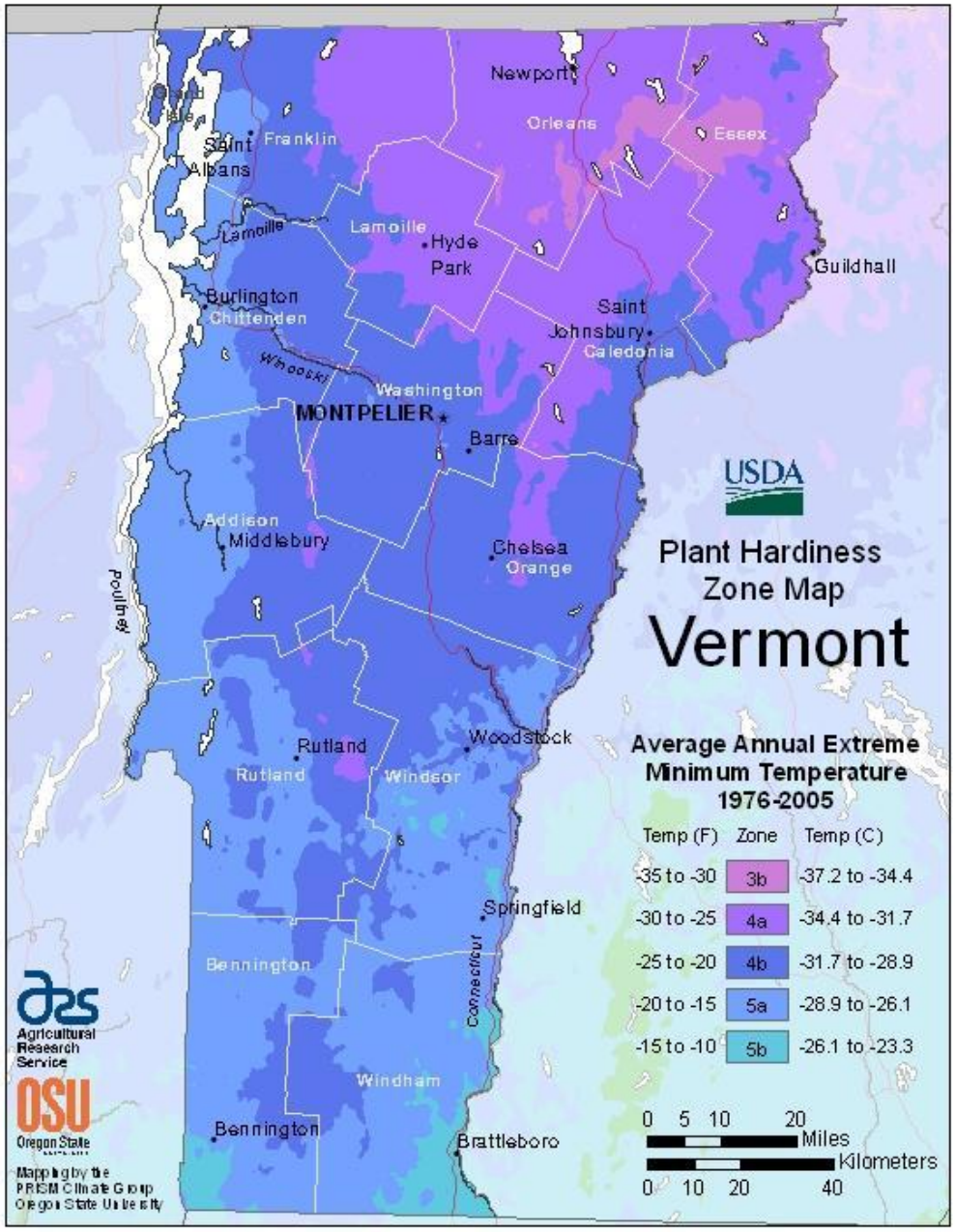
6: -10 to 0°F

Detailed Map

(most recent)

- **VT Hardiness Zone Map 1976-2005**
  - **mean 1990**
  - **South now zone 6**
- **Half-zone in 16 yrs = 3.1°F/ decade**
  - ***triple the rise-rate of winter mean T***
  - ***3 zones/century***
- ***http://planthardiness.ars.usda.gov/PHZMWeb/***

(Krakauer, Adv. Meteor. 2012)

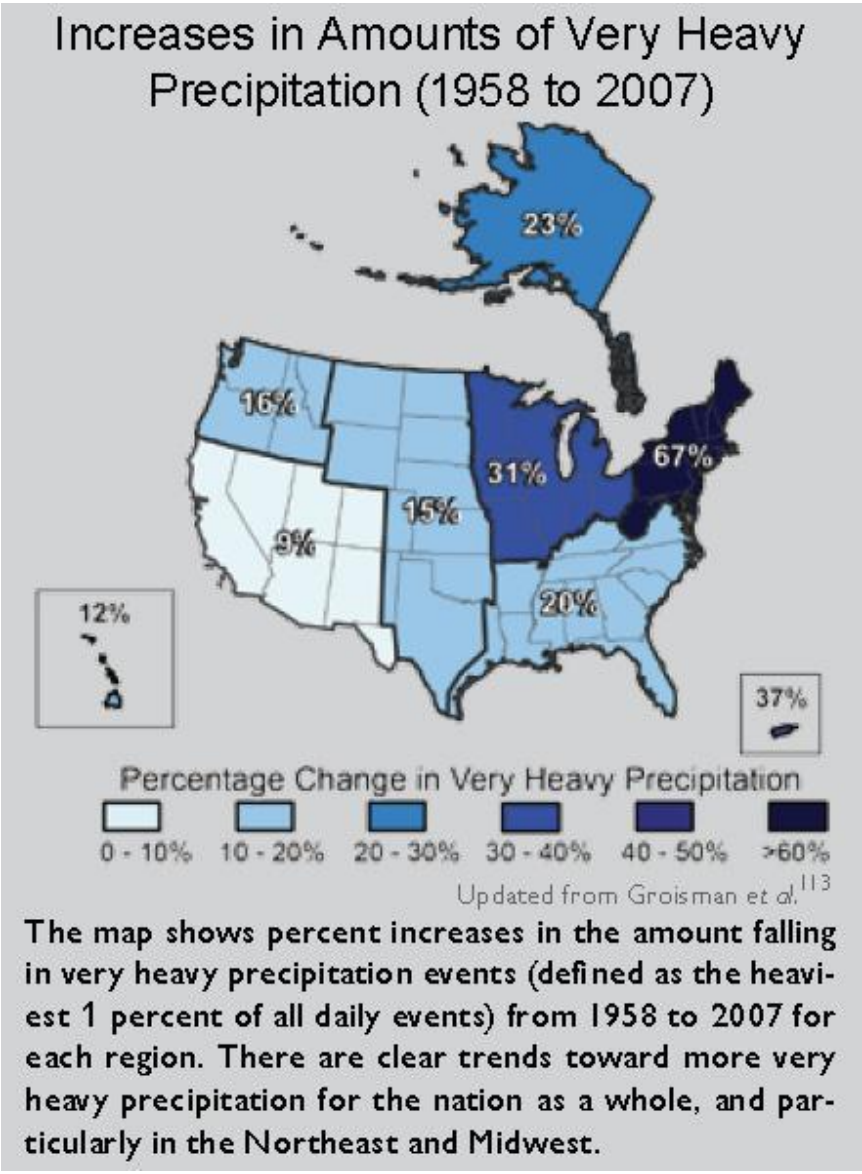


Bennington & Brattleboro are becoming zone 6 *(T_{min} > -10F)*

Very Heavy Precipitation Is Increasing

(USGCRP, 2009)

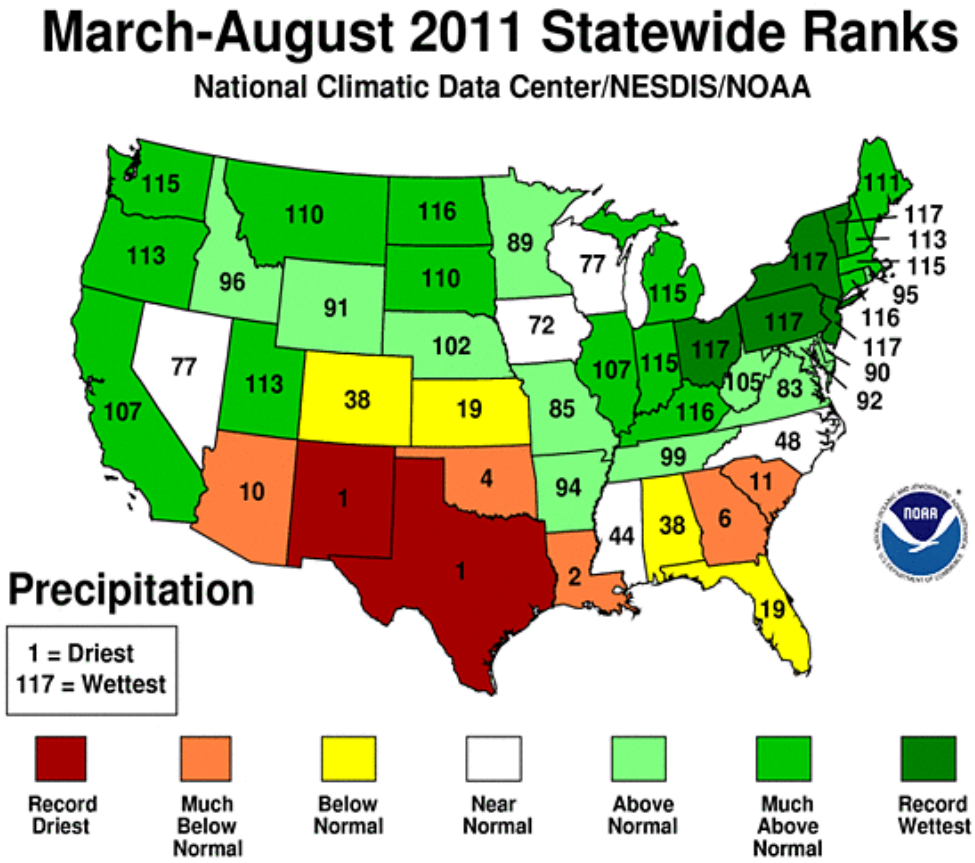
- **Precipitation Extremes**
- **Most of the observed increase in precipitation during the last 50 years has come from the increasing frequency and intensity of heavy downpours.**
- **67% increase in Northeast**
- **Summer "stormflow" increasing**



The map shows percent increases in the amount falling in very heavy precipitation events (defined as the heaviest 1 percent of all daily events) from 1958 to 2007 for each region. There are clear trends toward more very heavy precipitation for the nation as a whole, and particularly in the Northeast and Midwest.

2011 Floods: VT and NY

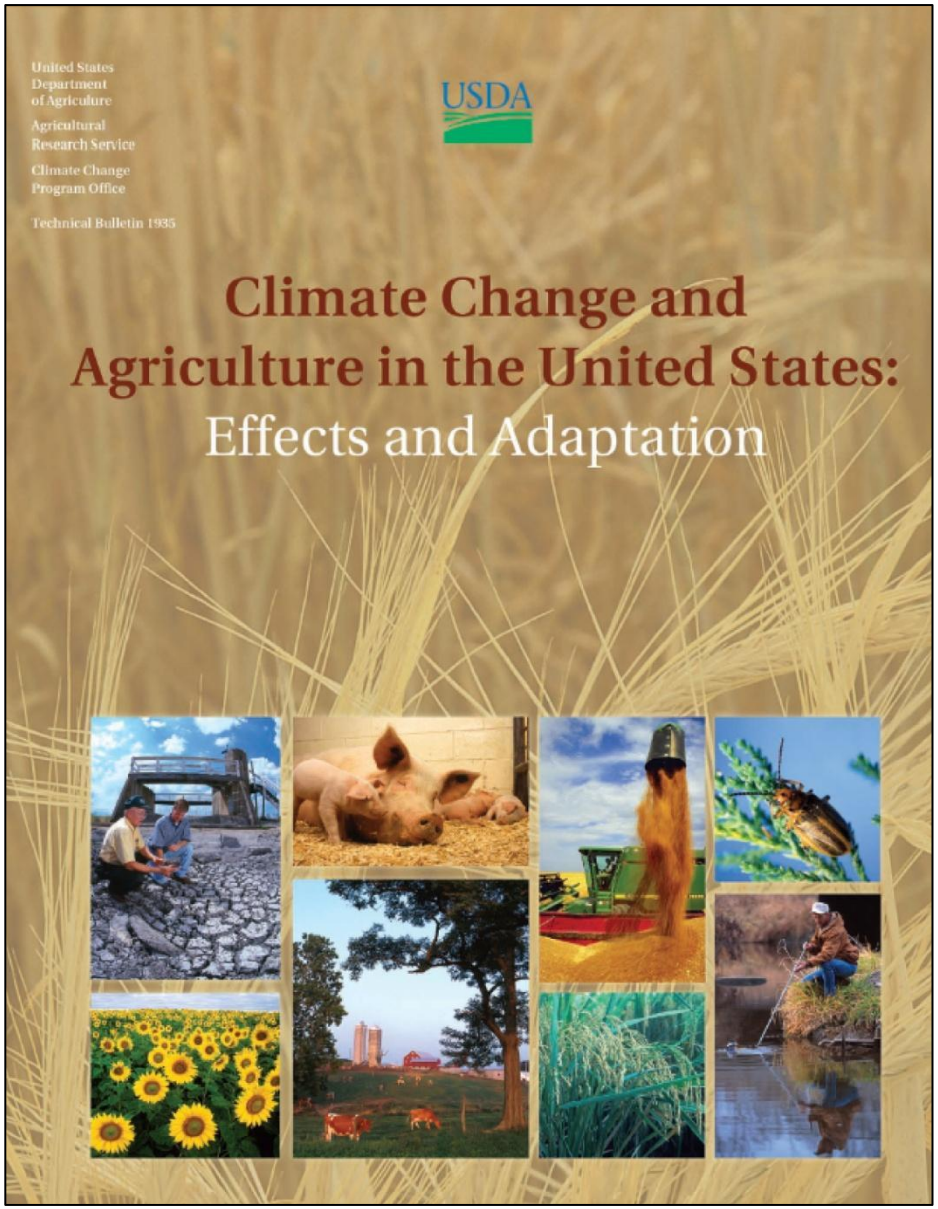
- **Record spring flood: Lake Champlain**
- **Record flood with tropical storm Irene**



March-August, 2011

- **Record wet : OH to VT**
- **Record drought: TX & NM**

- **'Quasi-stationary' pattern**



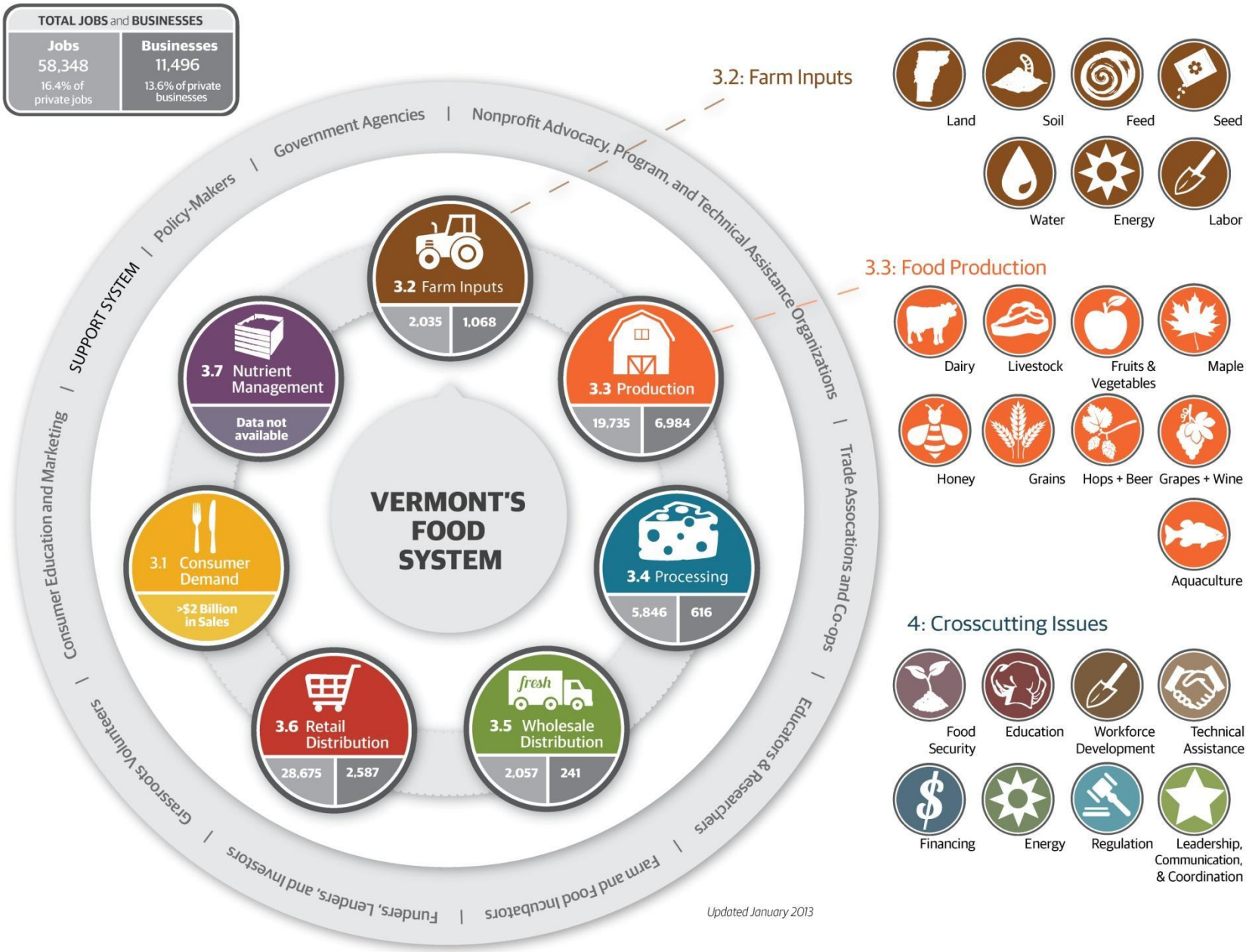
Rising temperatures and altered precipitation patterns will affect agricultural productivity.

Livestock production systems are vulnerable to temperature stresses.

Current stresses from weeds, diseases, and insect pests on plants and animals will be exacerbated; pollinator life cycles altered.

Ecosystem services (e.g., maintenance of soil and water quality, flood control) that food systems depend on will be damaged.

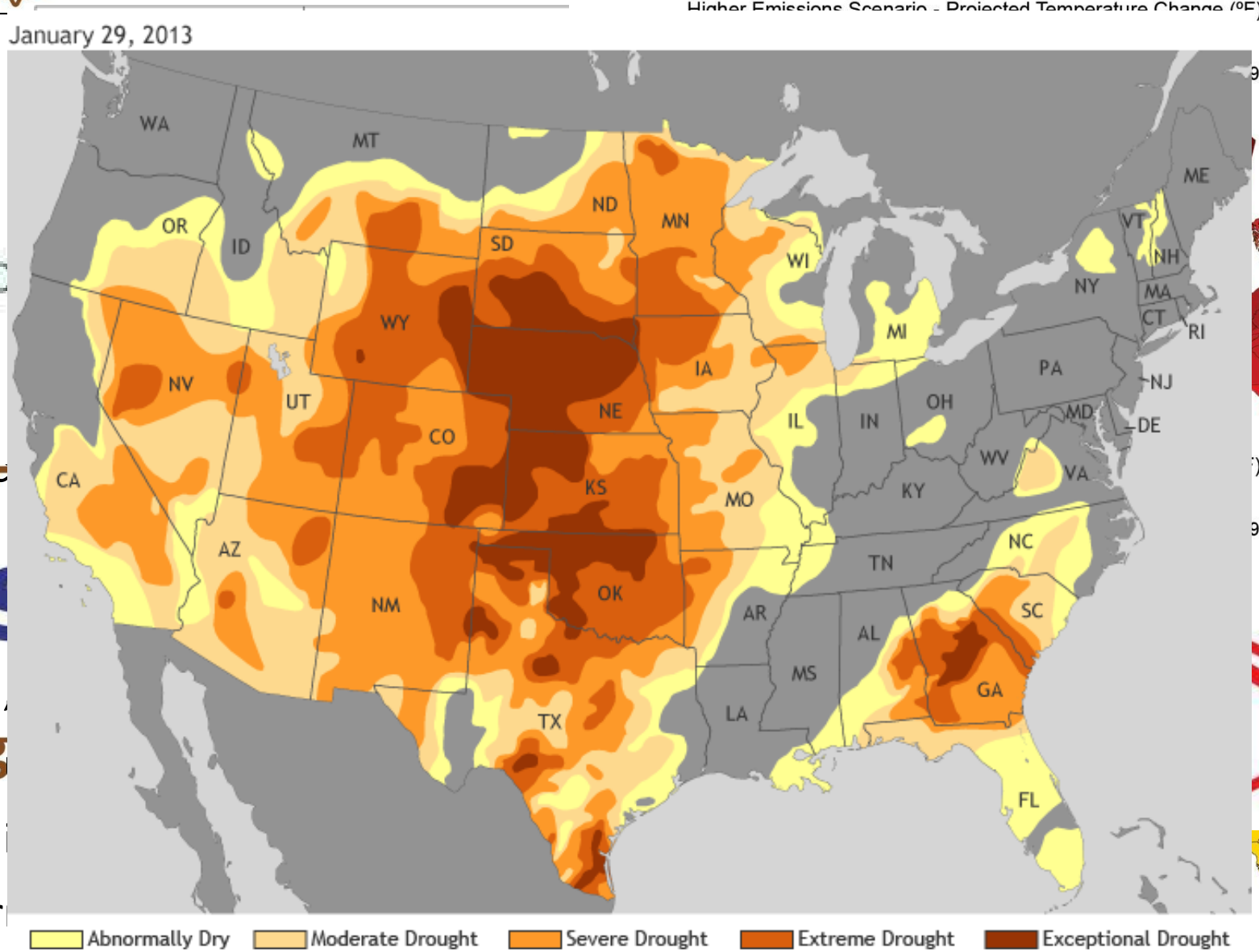
Increased incidences of extreme weather events will impact food production around the world.


TOTAL JOBS and BUSINESSES
Jobs
58,348
16.4% of private jobs
Businesses
11,496
13.6% of private businesses
SUPPORT SYSTEM
Policy-Makers
Government Agencies
Nonprofit Advocacy, Program, and Technical Assistance Organizations
Trade Associations and Co-ops
Educators & Researchers
Farm and Food Incubators
Funders, Lenders, and Investors
Grassroots Volunteers
Consumer Education and Marketing
VERMONT'S FOOD SYSTEM
3.2 Farm Inputs
2,035
1,068
3.3 Production
19,735
6,984
3.4 Processing
5,846
616
3.5 Wholesale Distribution
2,057
241
3.6 Retail Distribution
28,675
2,587
3.1 Consumer Demand
>$2 Billion in Sales
3.7 Nutrient Management
Data not available
3.2: Farm Inputs
Land
Soil
Feed
Seed
Water
Energy
Labor
3.3: Food Production
Dairy
Livestock
Fruits & Vegetables
Maple
Honey
Grains
Hops + Beer
Grapes + Wine
Aquaculture
4: Crosscutting Issues
Food Security
Education
Workforce Development
Technical Assistance
Financing
Energy
Regulation
Leadership, Communication, & Coordination
Updated January 2013

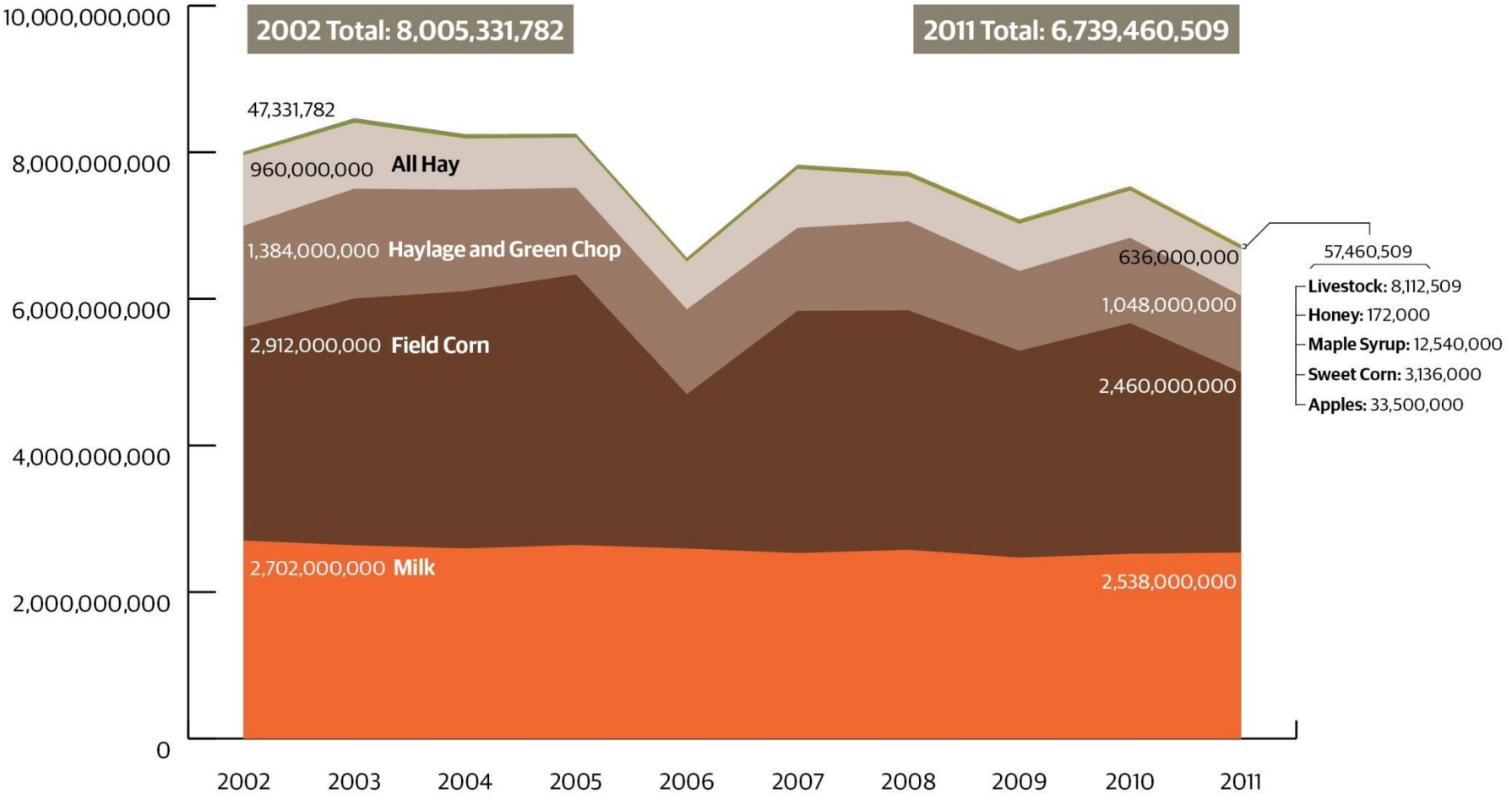
3.1: Consumer Demand

One hundred years ago Vermont produced most of the food it consumed. The quantity, quality and variety depended on local conditions. Most of the food eaten by Vermonters in those days was produced and preserved by their own efforts. This self-sufficiency was dictated by necessity; Vermonters did not choose to be self-sufficient, they had to be. A local diversified agriculture fed Vermont and also supplied many products to other areas of the Northeast.

3.2: Farm Inputs

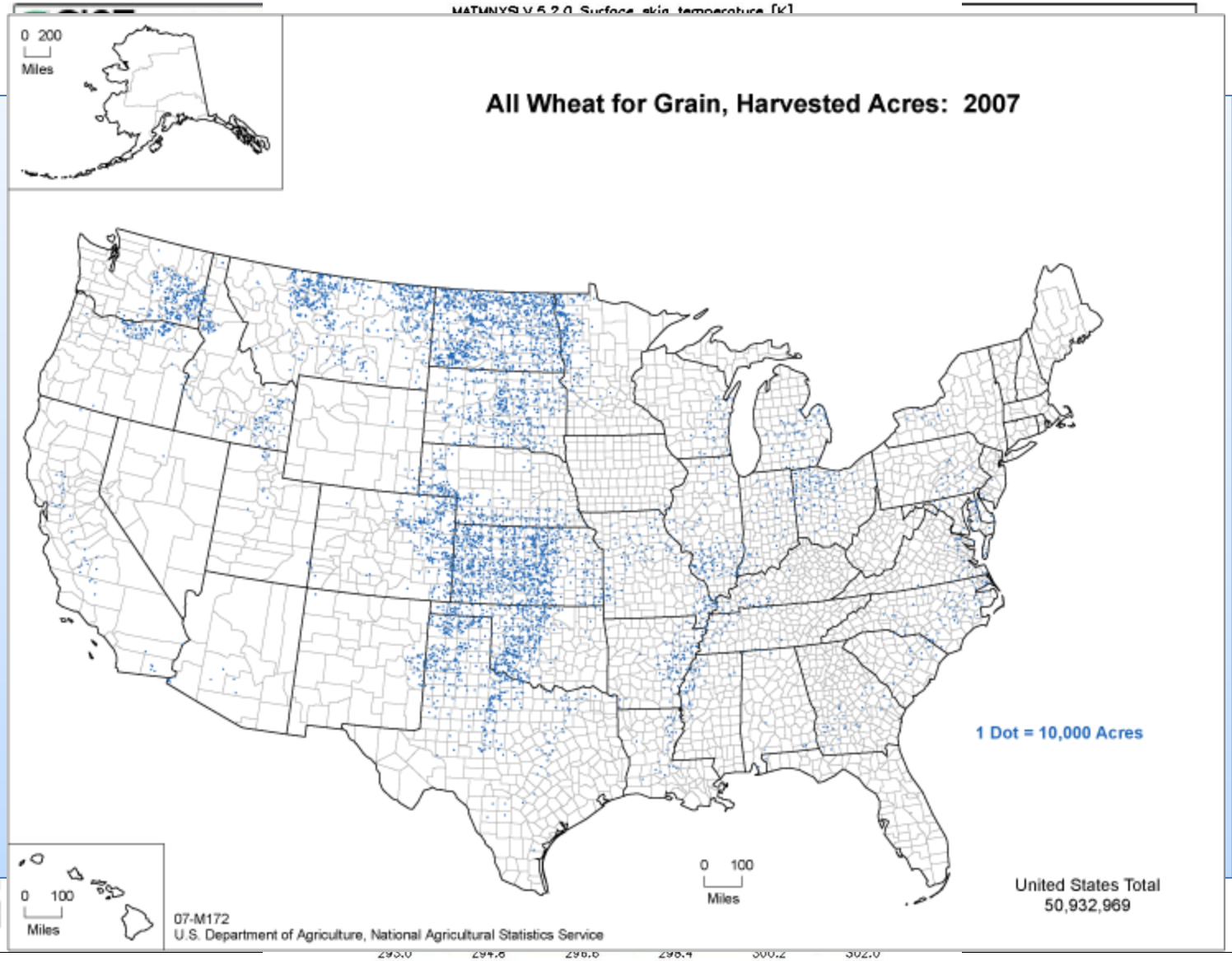


3.3: Food Production



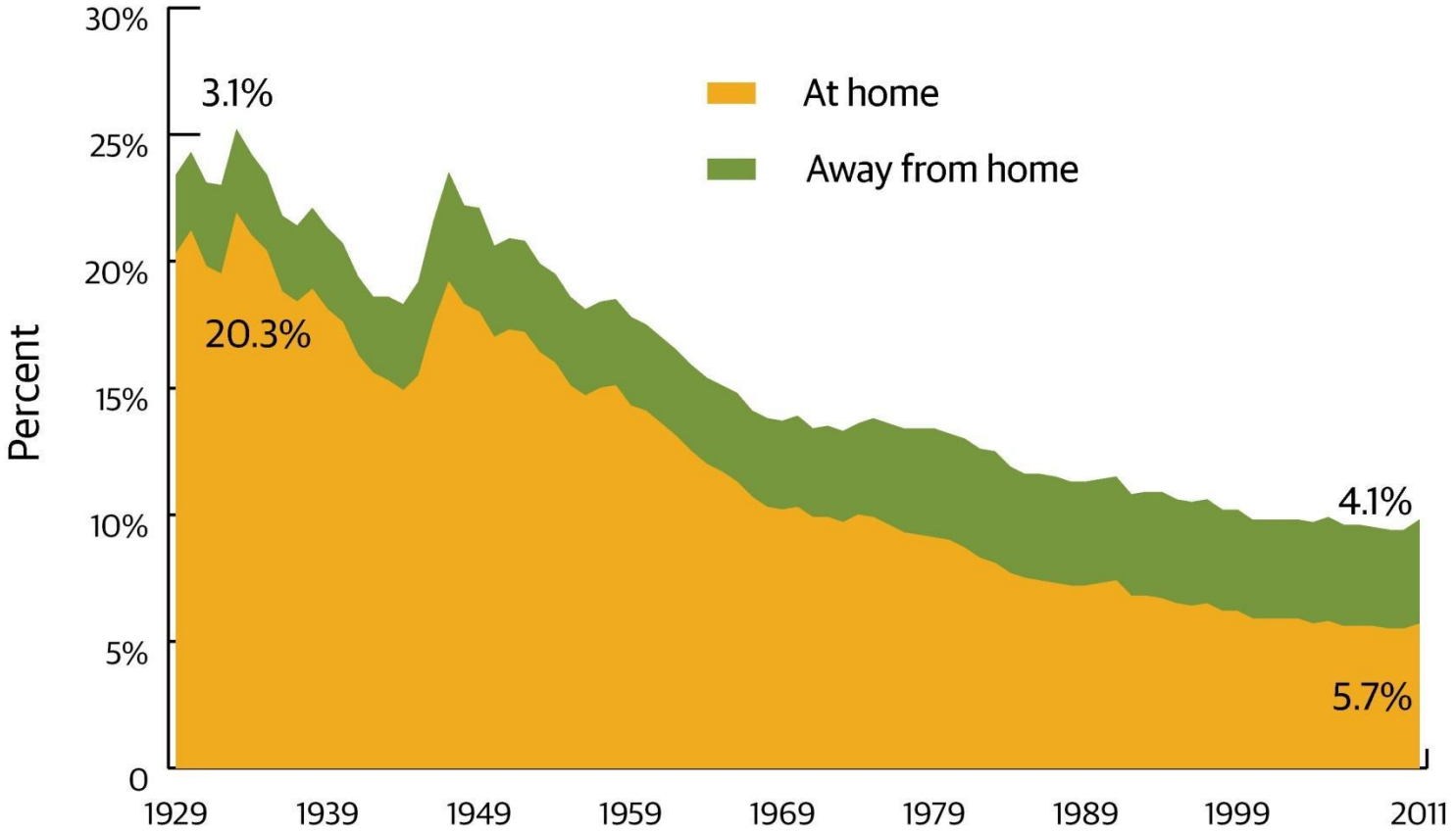
Source: USDA Census of Agriculture, USDA NASS, multiple years. *Note: fruit and vegetable production, other than apple and sweet corn production, are not included in this graphic due to small production values that would not be visible. Apple production, for example, which is represented by the small green line, accounts for 91% (3,547 acres) of noncitrus fruit orchard acres in Vermont. In comparison, berry farm production occurred on 705 acres, approximately 20% of the apple orchard acreage. Sweet corn production, which is barely visible on this graph, accounted for approximately 39% of all acreage in vegetable production in Vermont.

3.4: Food Processing



3.5: Distribution and Storage

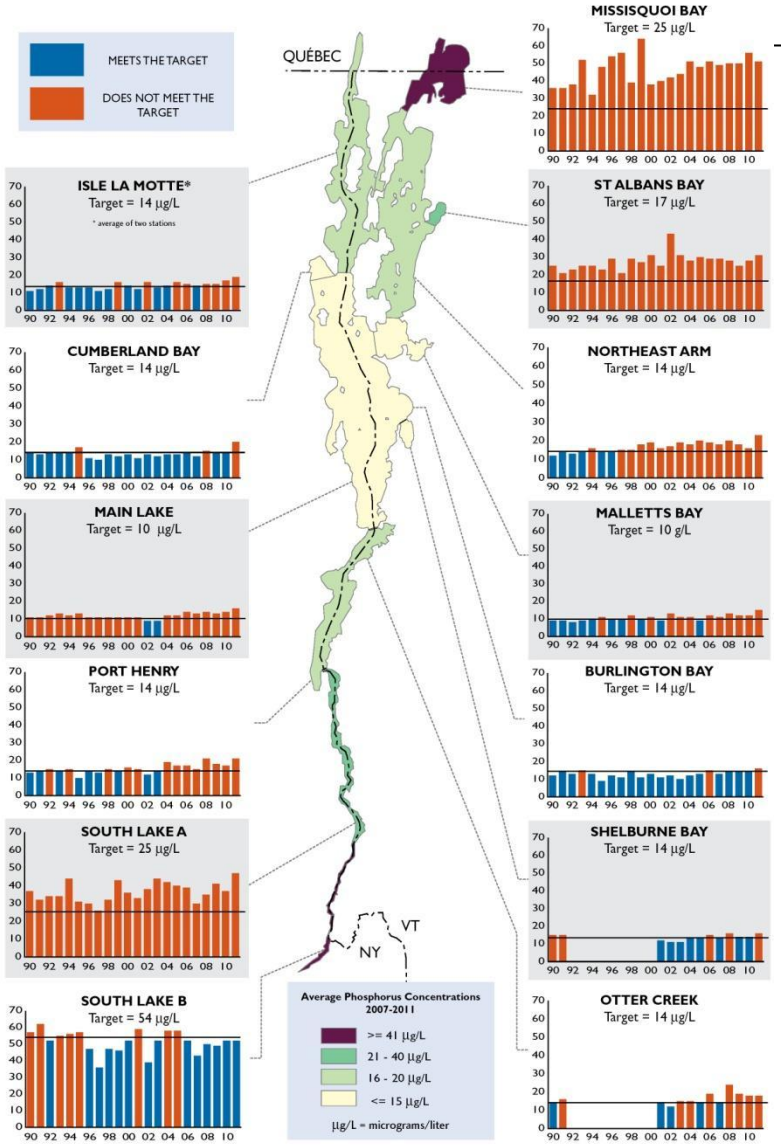
3.6: Retail Distribution



Source: USDA Economic Research Service, Table 7, *www.ers.usda.gov/Briefing/CPIFoodAndExpenditures/Data/Expenditures_tables/table7.htm*.

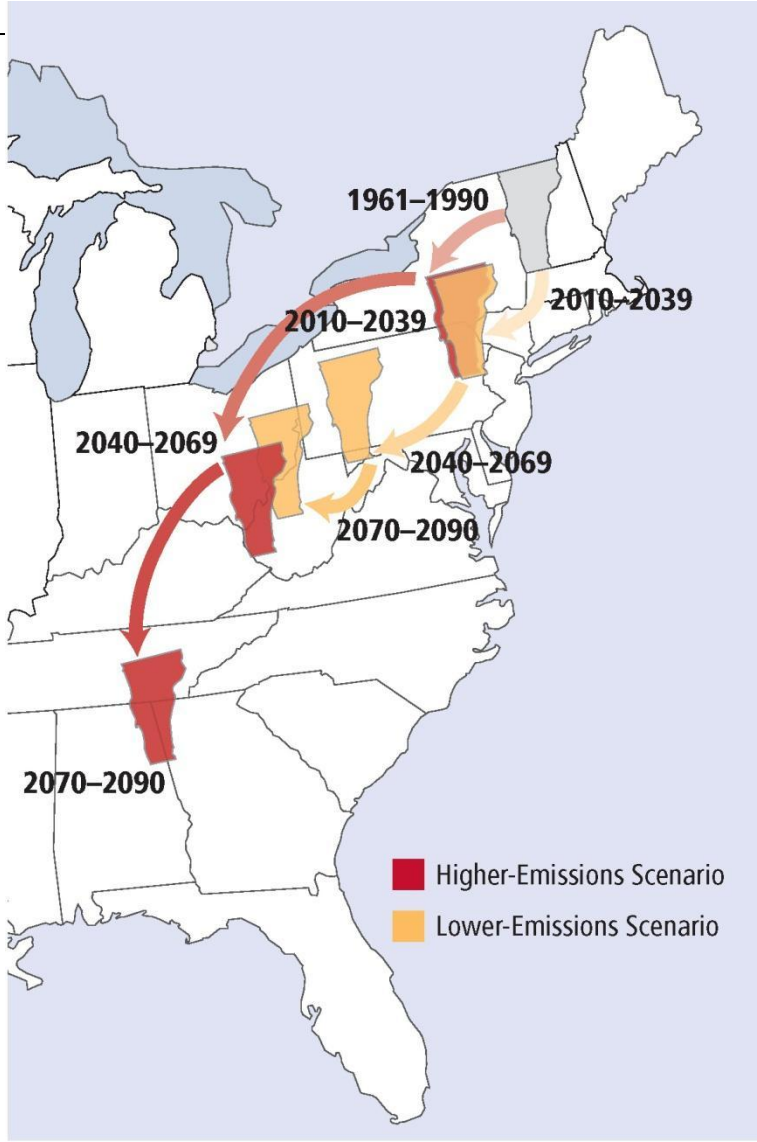
foodretailing.htm.

3.7: Nutrient Management



DATA SOURCE: Long Term Monitoring Program (LCBP, VTANR, NYSDEC)

4.3: Working Conditions




Thanks!
Photo credit: Lindsay Harris