Regionalizing the Food System for Public Health and Sustainability

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The Urban Design Lab (UDL) is part of The Earth Institute, Columbia University. UDL researchers are architects and urban designers. Some have engineering, public health and social science expertise as well.

The UDL works closely with experts in diverse fields in the natural & social sciences, including public health & economics. The UDL uses design methodologies applied to cutting-edge research at a community level in New York City and other urban areas across the nation and internationally.

It is increasingly apparent that the complexity of the social, economic, and environmental problems we are facing requires an innovative, inclusive, and cross-disciplinary approach.

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Regionalizing the Food System

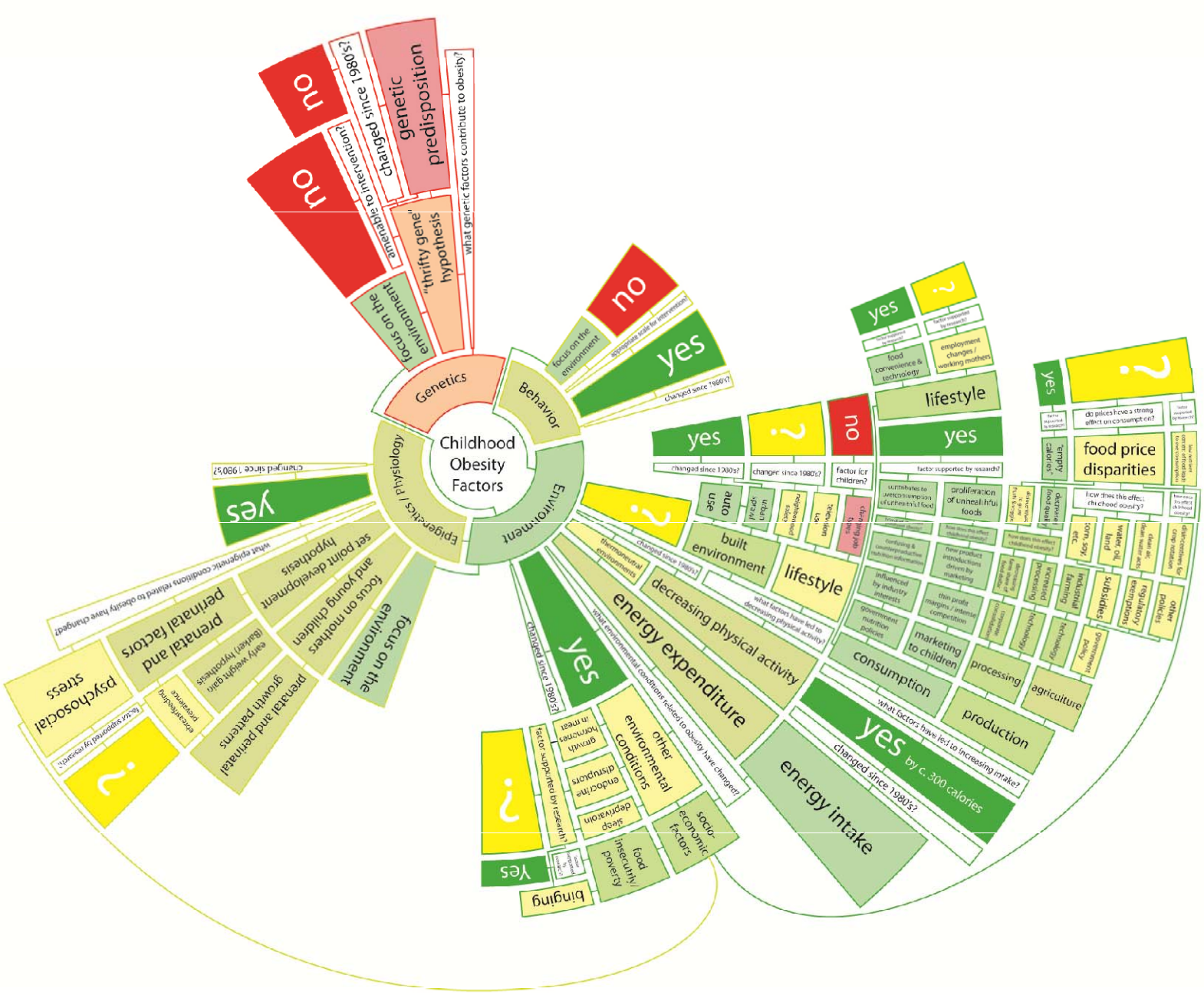

Image: Urban Design Lab and MIT Collaborative Initiatives

The UDL's focus on food systems began with a project to address childhood obesity from a design perspective. Supporters of the project from the health insurance industry understood the importance of having an out-of-the box approach to this complex problem.

Design methods use a range of explanatory and communication techniques. This decision-making tool outlines factors contributing to childhood obesity, and is color-coded to highlight areas most amenable to intervention.

Design methodology is a combination of a scientific, analytic approach with an intuitive, synthetic, solutions-oriented approach.

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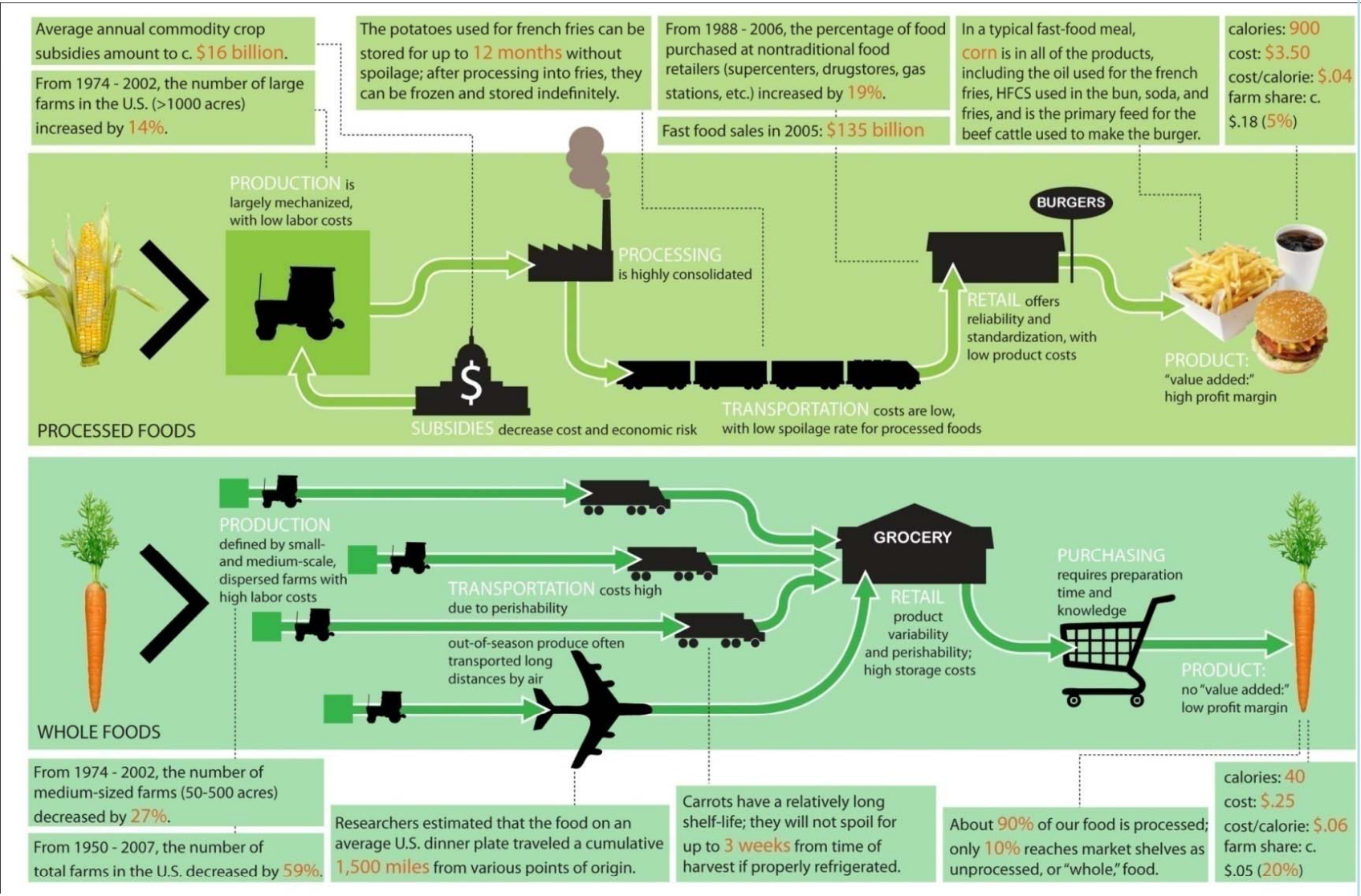
Regionalizing the Food System



We develop visual communication and decision-making tools to make sense of complex systems, which is part of our training in building and urban environment design.

This diagram was developed to help communicate why processed food is often less expensive per calorie than fresh food, which is counterintuitive. It synthesizes data from various sources, visualizing complex systems information in an easily comprehensible format.

Image: Urban Design Lab and MIT Collaborative Initiatives

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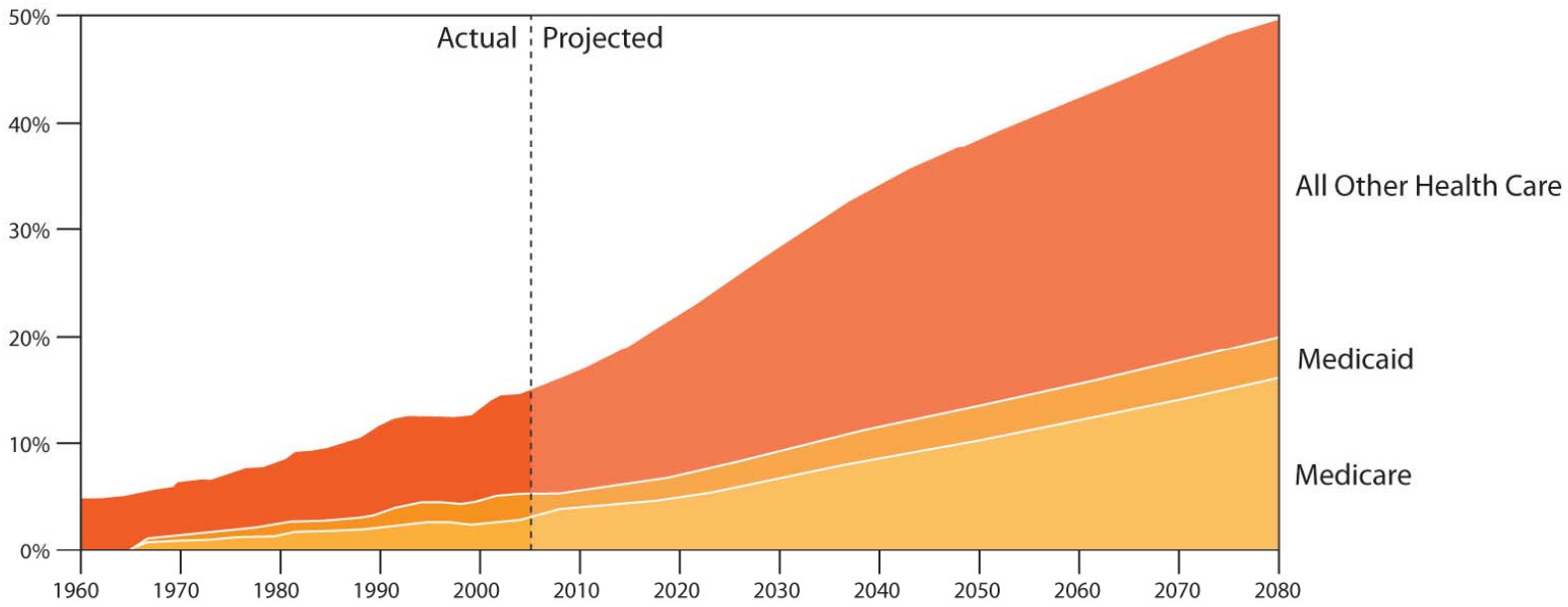
Health care spending as percentage of U.S. GDP, 1960 - 2080



In 2000, the total cost of obesity in the United States was estimated to be $117 billion

During the obesity research, it became apparent that, for a variety of reasons, we had to focus on the intake side of the energy equation.

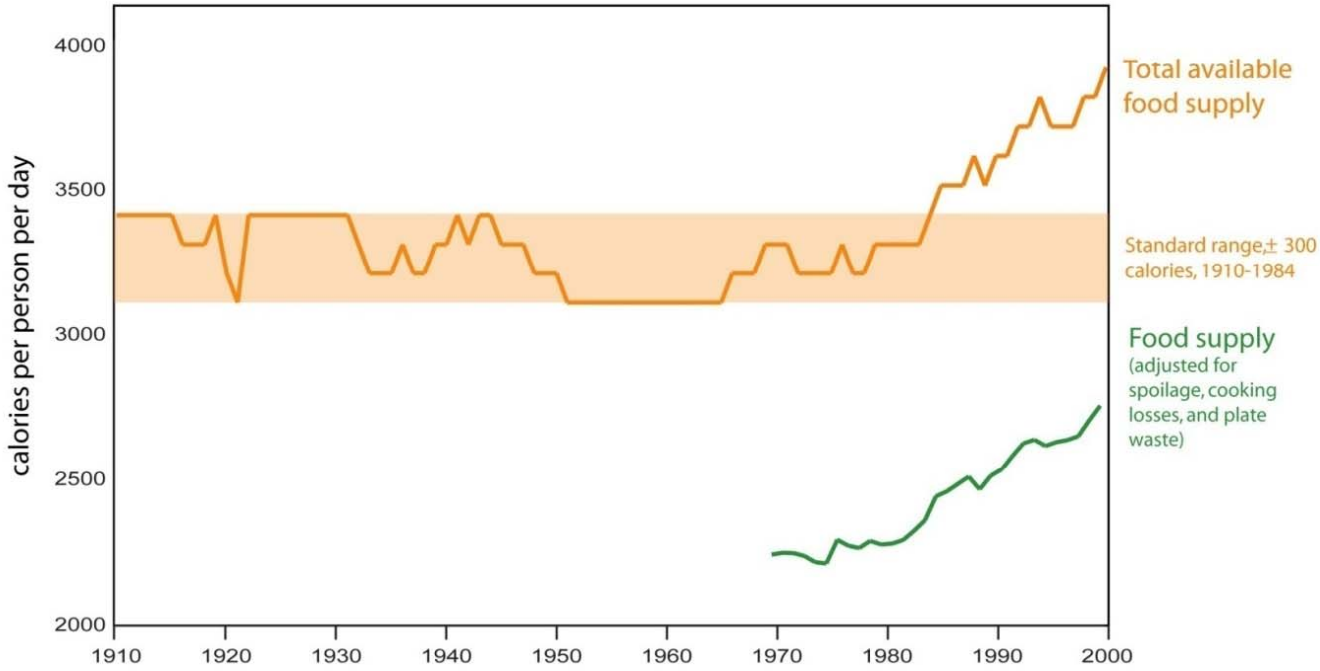
This Congressional Budget Office report from 2007 found that by 2080, up to 50% of our entire GDP could be consumed by health care spending. This is almost entirely due to increases in chronic diseases(obesity, diabetes, cardiovascular disease), all of which have a dietary component.

The unintended consequences of the American food system are leading to serious economic disruption.

Conclusion: to change our health care system we need to change the food system.

Source: Congress of the United States Congressional Budget Office, 2007. “The Long Term Outlook for Health Care Spending.”

Total per capita calorie availability in the U.S.



Clearly, something in the food system changed in the decades leading up to the 1980's, when per capita calorie availability suddenly increased dramatically.

Source: Putnam J, Allshouse J, and Kantor LS. 2002. "U.S. Per Capita Food Supply Trends: More Calories, Refined Carbohydrates, and Fats." *FoodReview, Vol. 25, Issue 3.*

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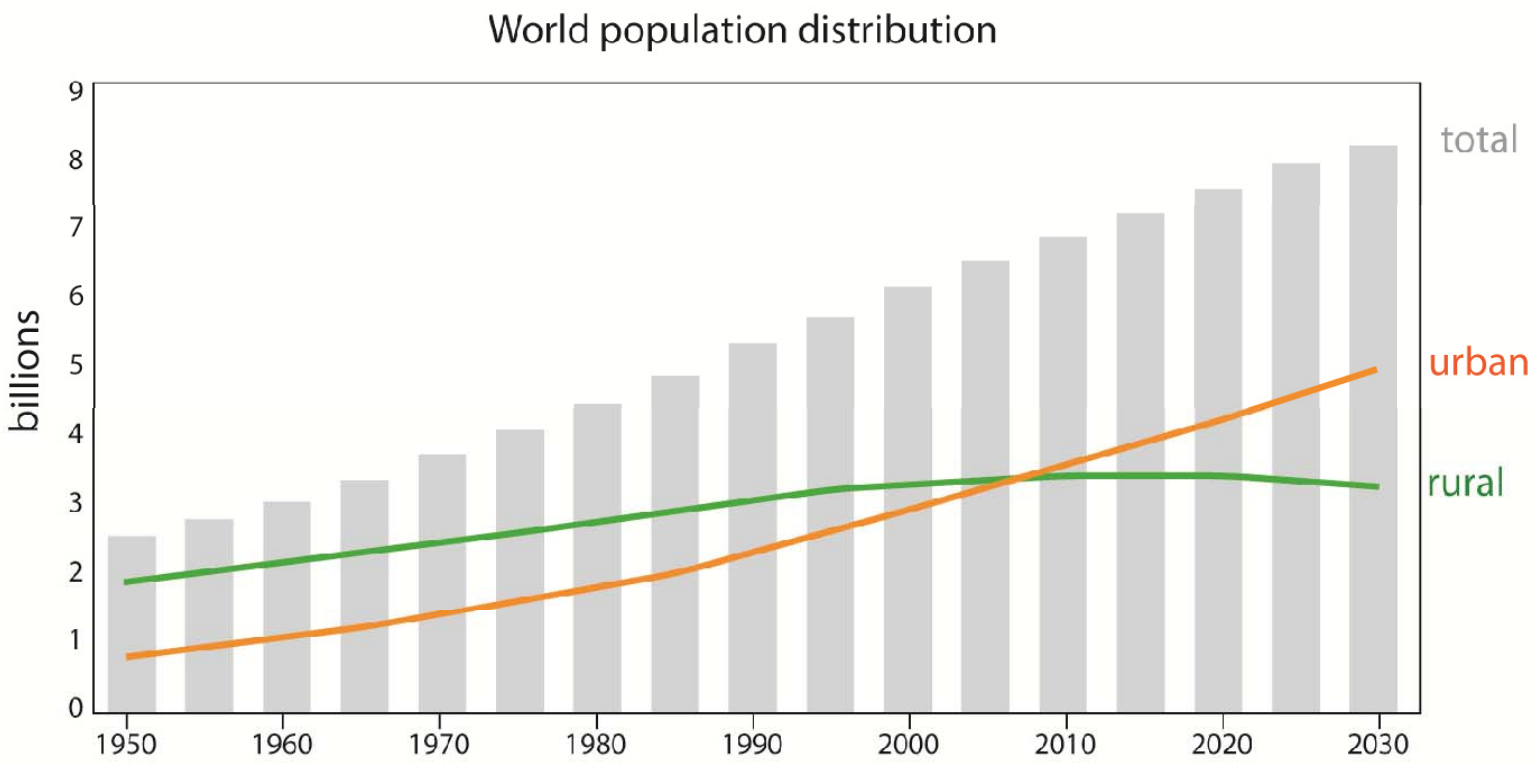

Since the origins of agriculture and cities in the Fertile Crescent, the urban and the agricultural landscapes have been integrally linked. This continues to be true today: the world's increasingly urban population is due primarily to changes in agricultural technology and resulting displacement of labor to cities.

For the first time in history, a majority of the world's population has shifted from being primarily rural to primarily urban.

Source: United Nations, DESA, Population Division: *World Population Prospects: The 2005 Revision.*

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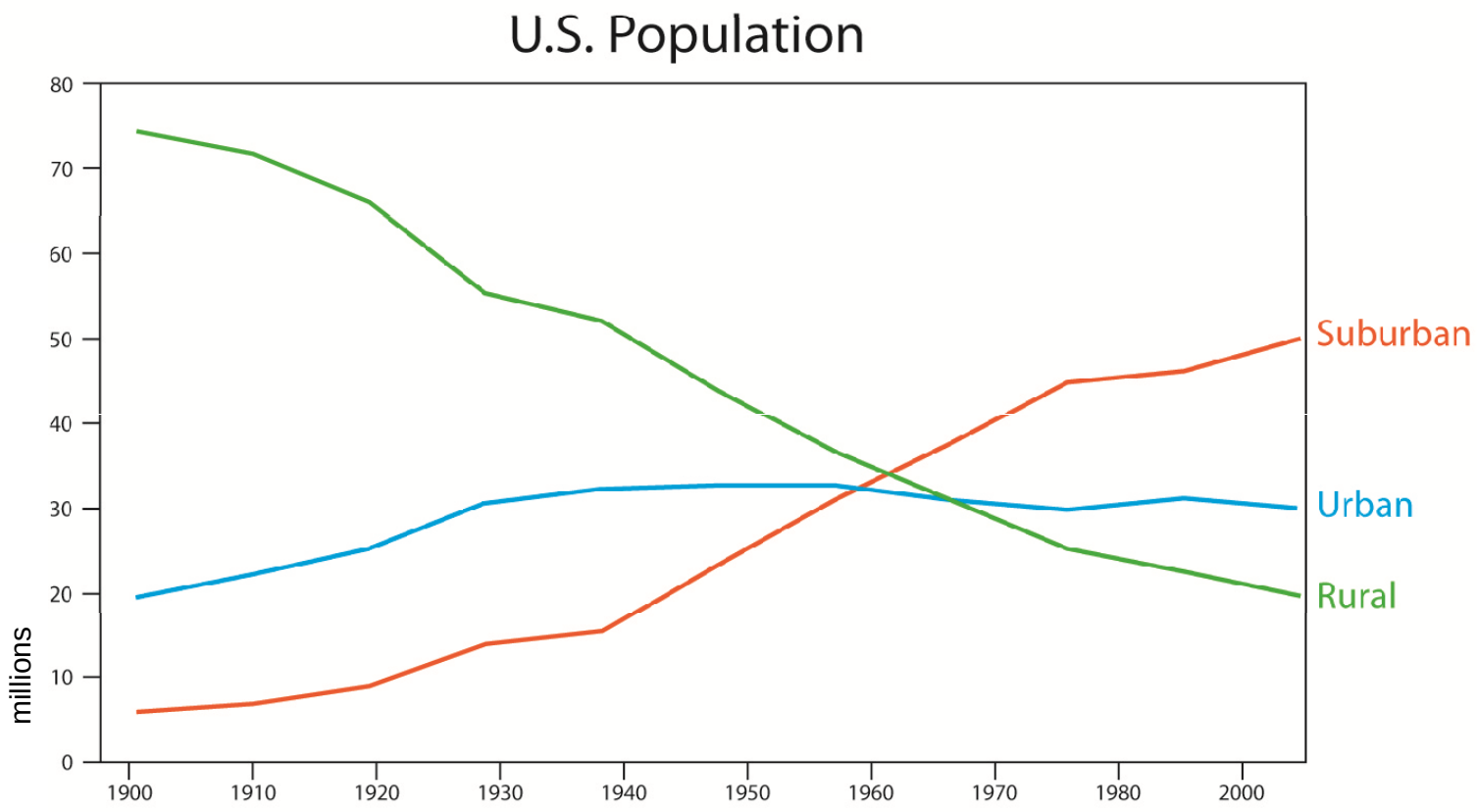

This shift occurred earlier in the US, and in some ways much of what we are dealing with is the ensuing disconnection between our food producing areas and our urban areas.

Source: US Census Bureau.

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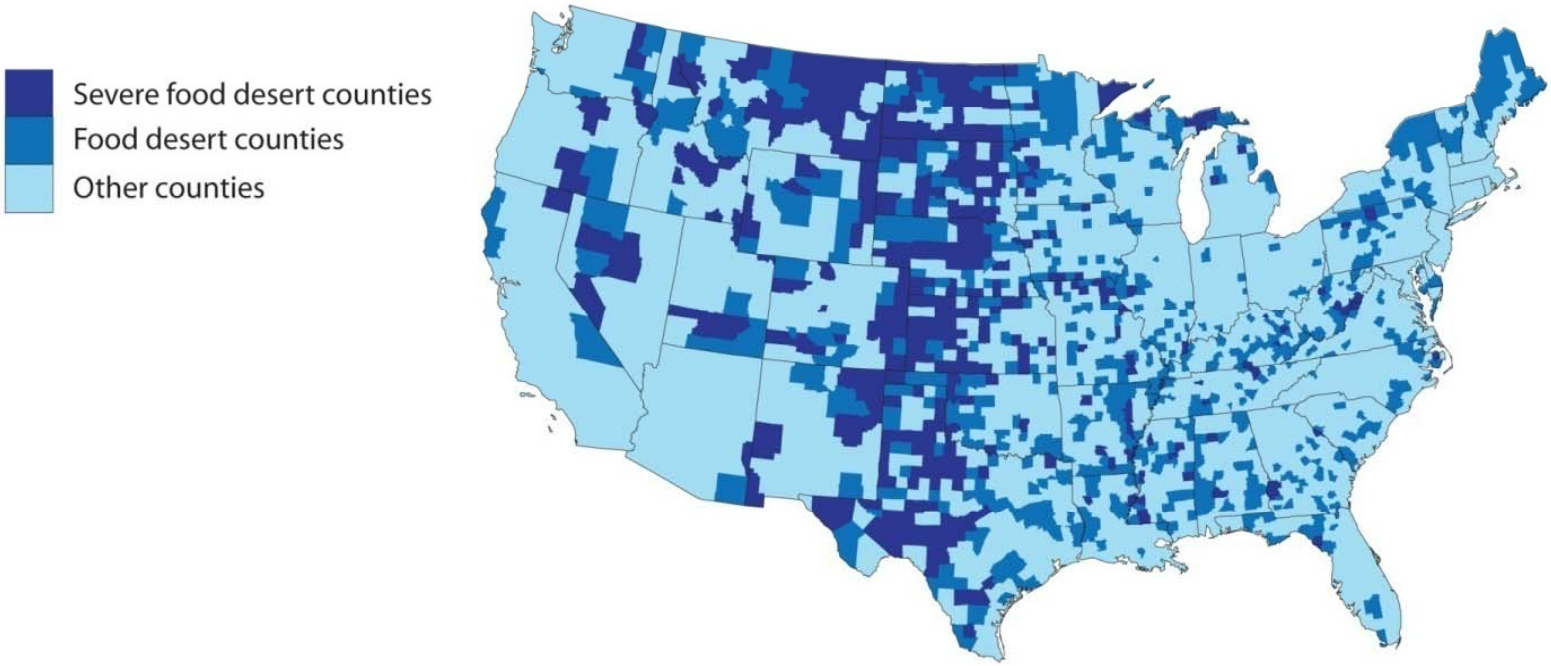

Rural Food Deserts

The existing form of the food system is characterized by large inefficiencies. Areas where food is produced also happen to correlate with areas characterized as food deserts.

Source: Blanchard, T.C., 2002. “Retail Concentration, Food Deserts, and Food Disadvantaged Communities in Rural America”

Image: Urban Design Lab and MIT Collaborative Initiatives

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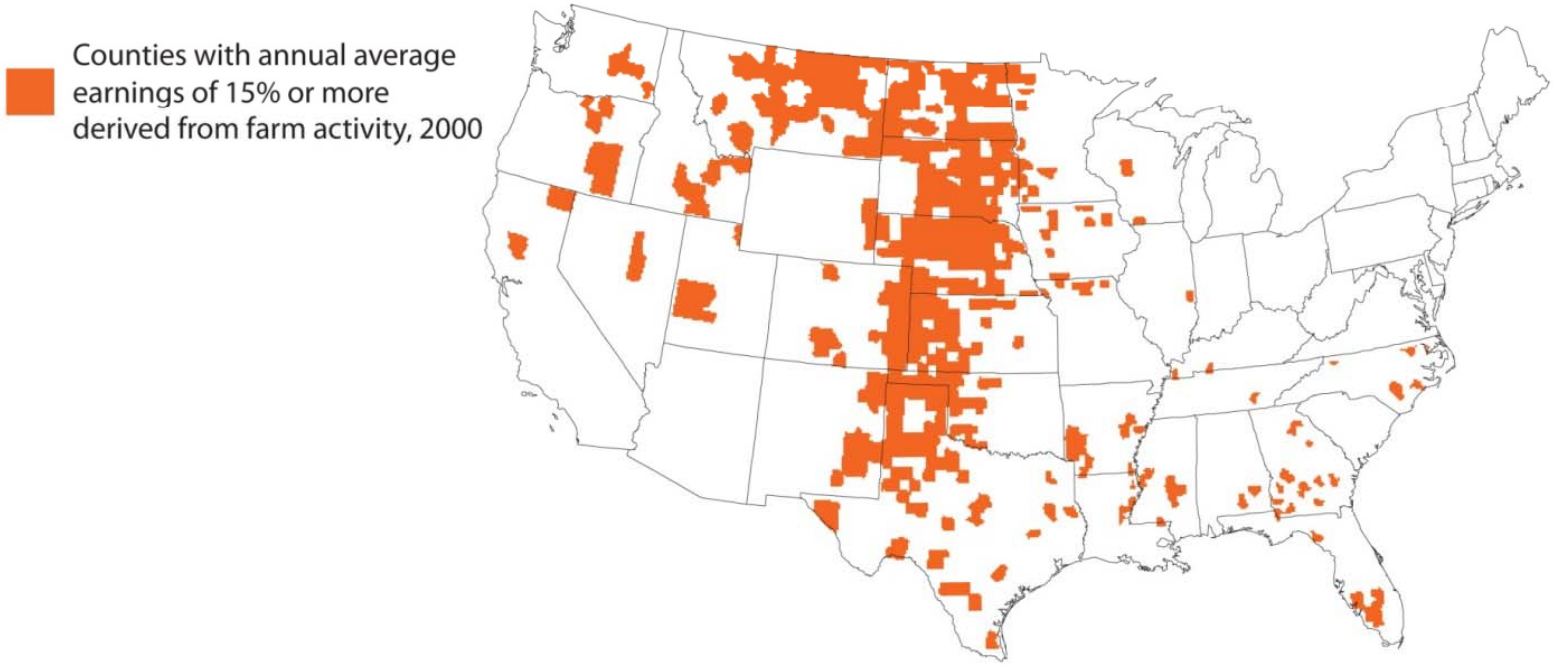
This points to severe challenges within the food system.



Farming Dependent Counties

Source: USDA Economic Research Service.

Image: Urban Design Lab and MIT Collaborative Initiatives

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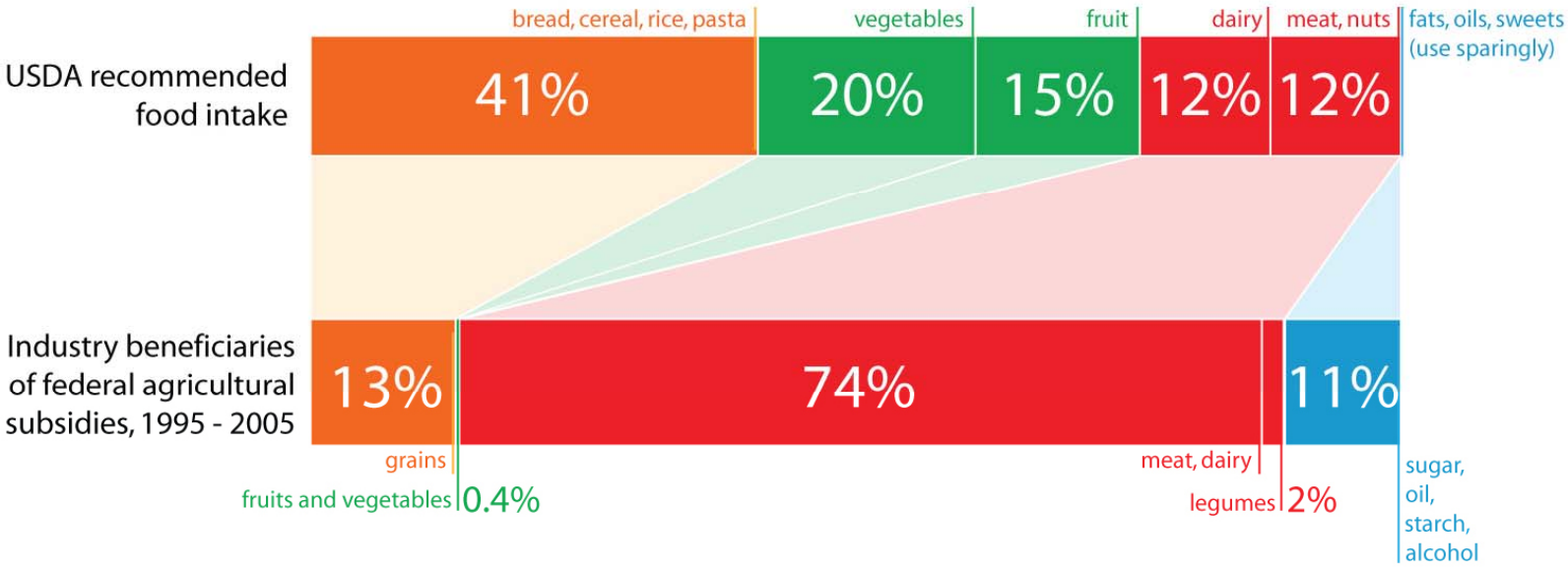
There is a lack of coordination within governmental agencies. The USDA, for example, has conflicting mandates.

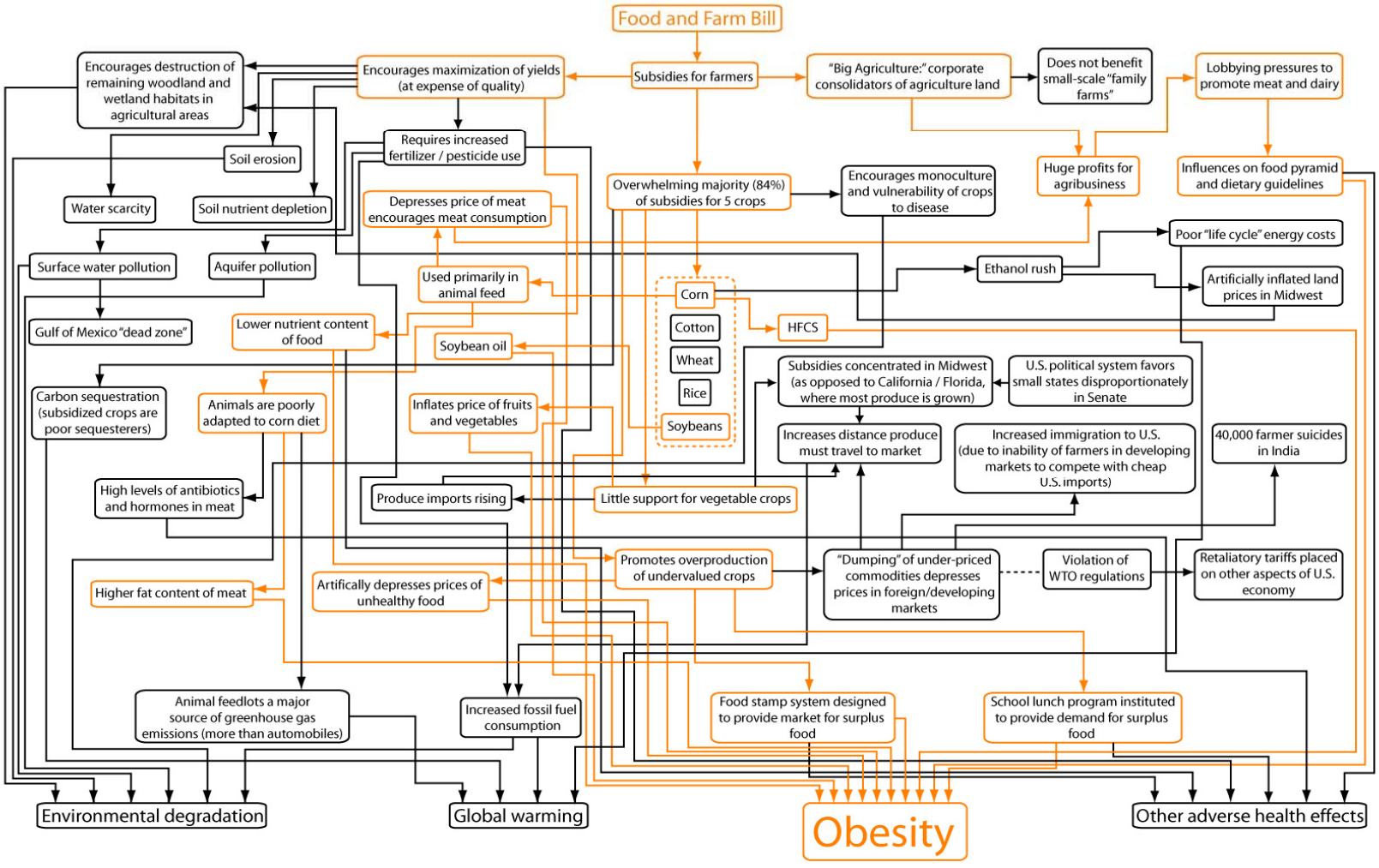
USDA: Conflicting Mandates



Source: Physicians Committee for Responsible Medicine, 2007.

Image: Urban Design Lab and MIT Collaborative Initiatives

Farm Bill: Unintended Consequences



Changes to the system need to consider the complex networks of causality that contribute to unintended consequences such as negative impacts on public health and environmental degradation. This diagram shows some of the ways in which the Farm Bill, as currently written, could be a contributing factor in increased prevalence of obesity .

Research on obesity has shown that, in order to have an impact on this complex problem, a comprehensive approach is necessary that would address **access, affordability, and awareness** of healthy food.

Regionalization is an approach that could address these factors and could additionally have positive impacts on climate change adaptation, environmental degradation, energy use, and economic development.

Image: Urban Design Lab and MIT Collaborative Initiatives

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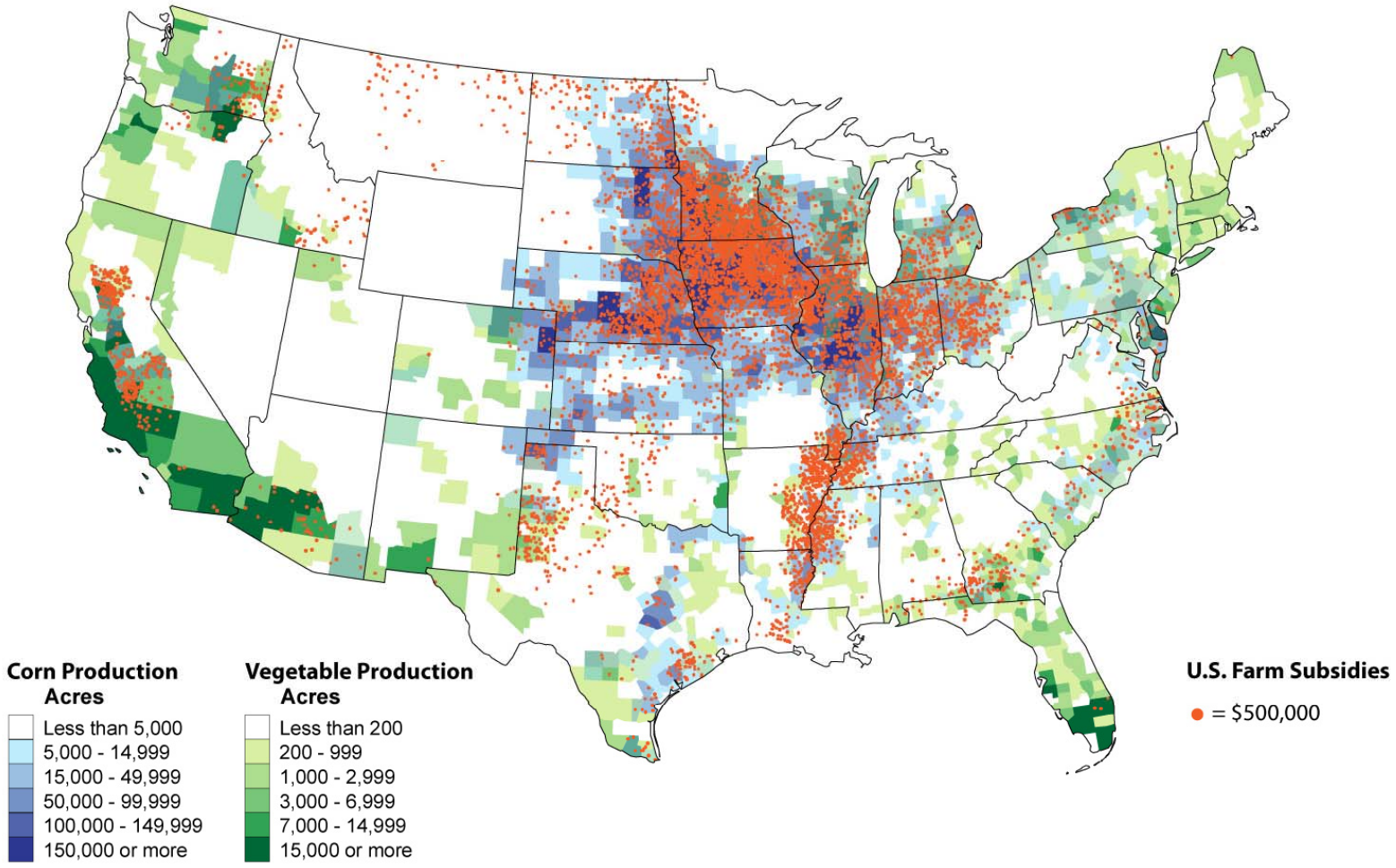
Commodity production and subsidy distribution



According to Dr. Fred Kirschenmann of the Stone Barns Center for Food and Agriculture, cities will likely be the drivers of food system change – for economic reasons, change will come from consumer demand.

This map shows that subsidies are concentrated in areas that produce the commodity crops and that the coasts, and particularly agricultural areas around major population centers, are where fruit and vegetable production is concentrated. Therefore the groundwork for beginning to regionalize a rich diversity of agricultural production around concentrations of consumers is already there.

Source: USDA Census of Agriculture, 2007.

Image: Urban Design Lab

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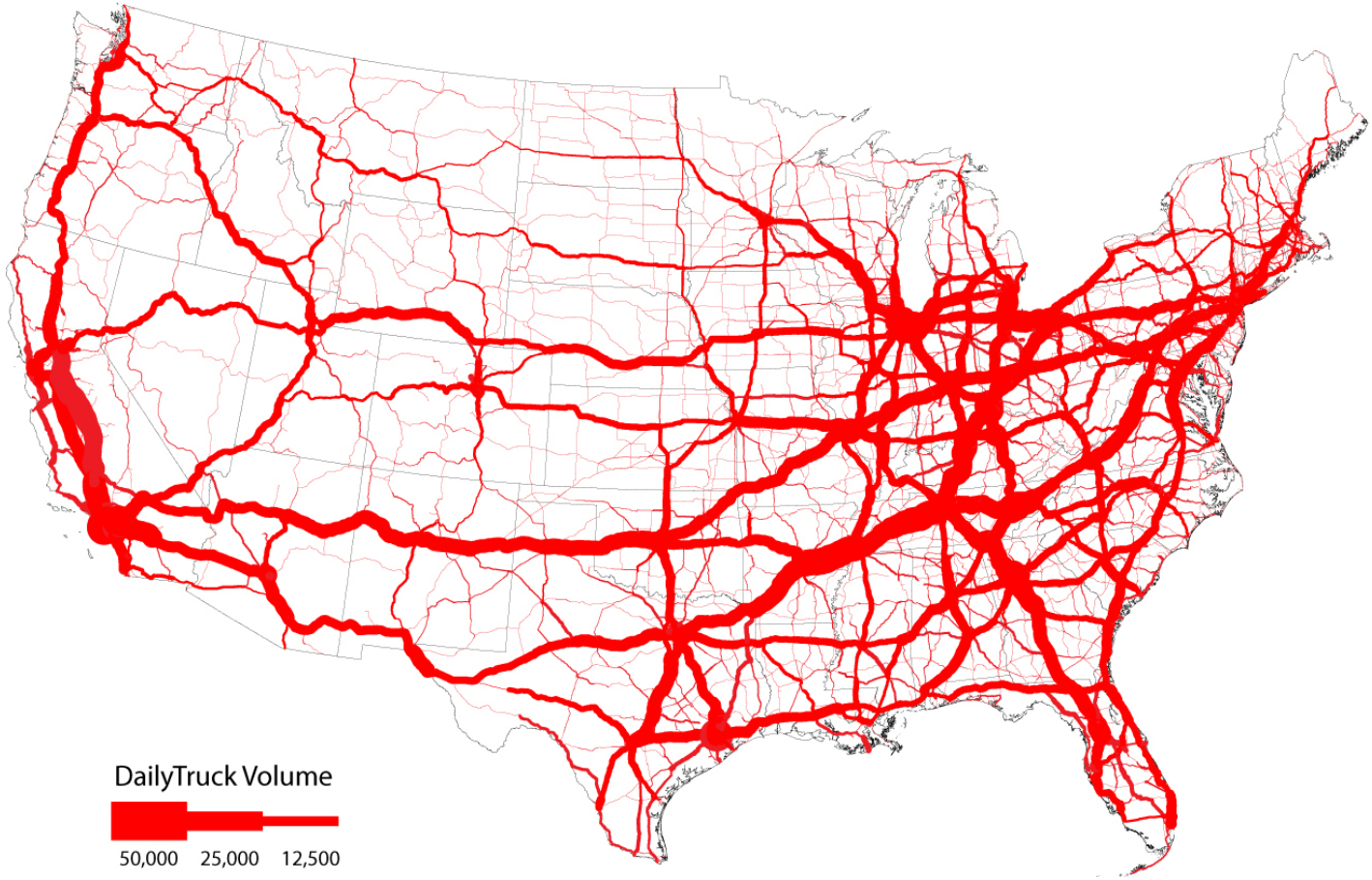
Average Daily Long-Haul Truck Traffic on the National Highway System



Historically, we think of systemic built environment interventions as consisting of three basic types of infrastructure:

1)large scale transportation systems, such as the Interstate highway network…

Source: U.S. Department of Transportation, Federal Highway Administration, Freight Analysis Framework, version 2.2, 2007.

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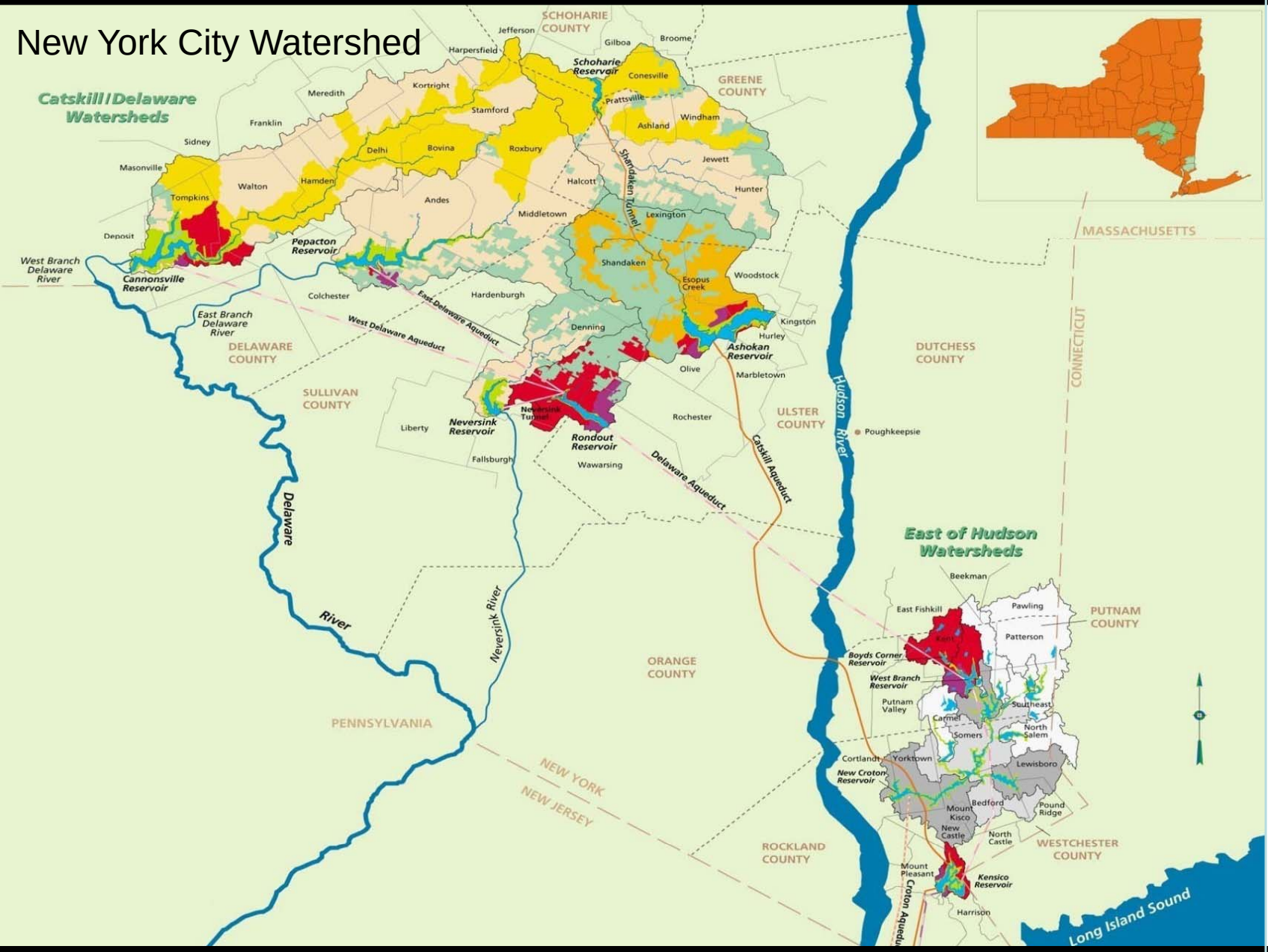
New York City Watershed



2) Water and energy supply systems, which are often regional in scale…

Source: New York City Dept. of Environmental Protection, Priority Areas for NYC Land Acquisition and Stewardship Program, 1997.

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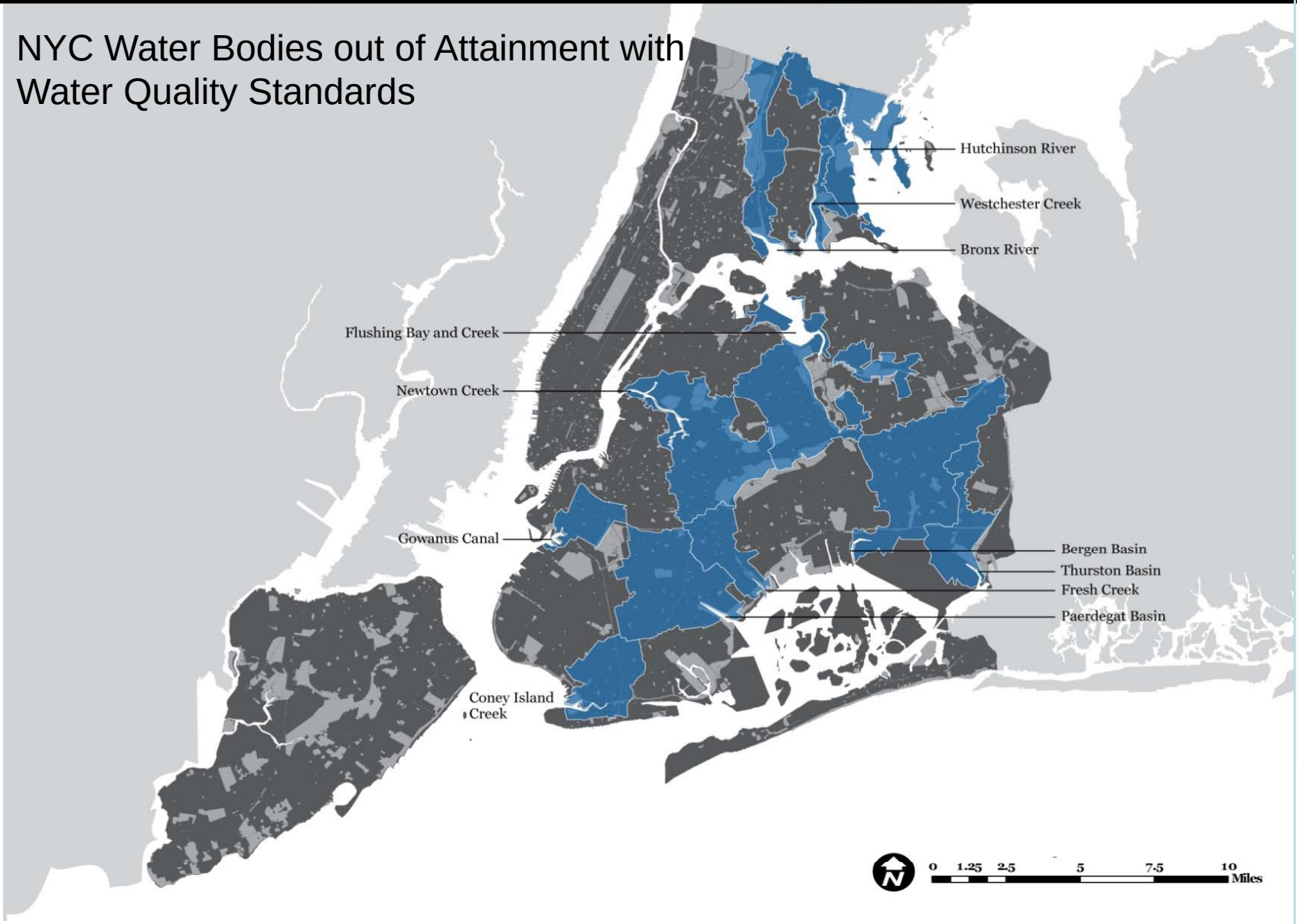
NYC Water Bodies out of Attainment with Water Quality Standards



…and 3) urban infrastructure, such as buildings or sewage systems.

Source: New York City Dept. of Environmental Protection. From PlaNYC Sustainable Stormwater Management Plan 2008.

Image: Urban Design Lab

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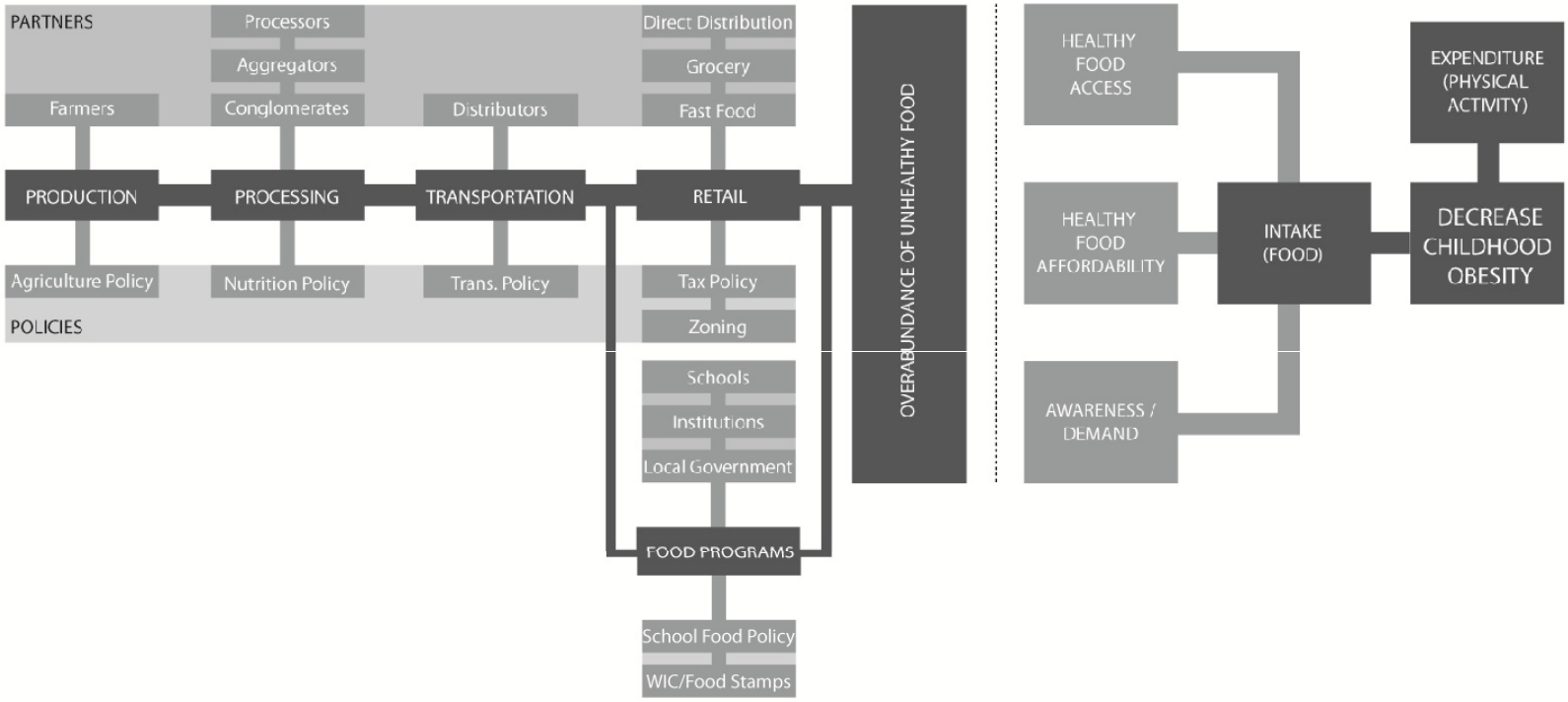

If we are to affect three critical areas: access to healthy food, affordability of healthy food, and awareness of healthy eating to stimulate demand, we must also address the food system from an infrastructure perspective.

Image: Urban Design Lab and MIT Collaborative Initiatives

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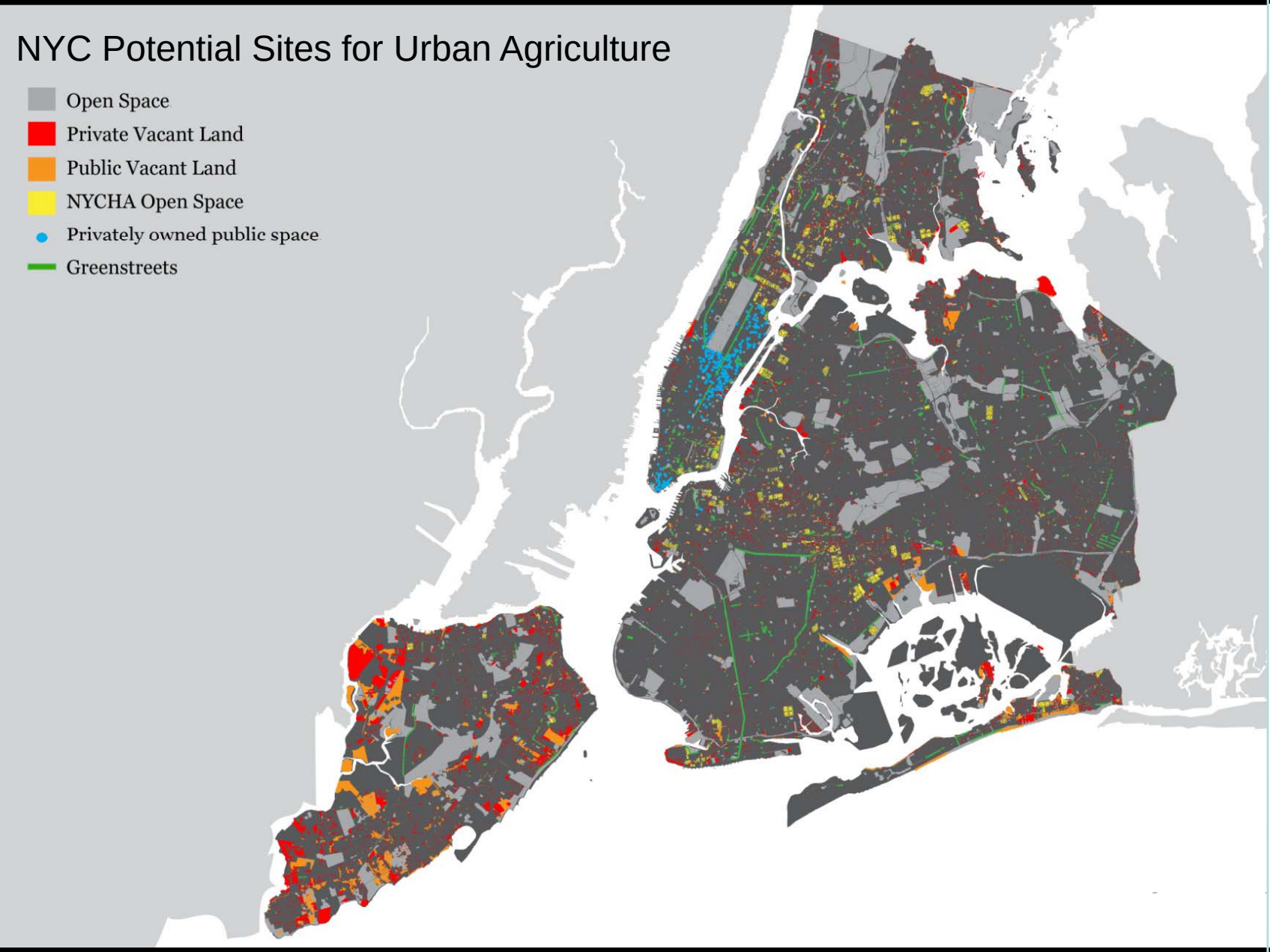
NYC Potential Sites for Urban Agriculture



The way to comprehensively affect healthy food affordability, accessibility, and awareness, is to approach food not just a commodity but as an infrastructural system, equivalent to our water, transportation, and energy systems, that needs to be managed and considered in all urban and regional planning efforts. This approach is necessary in order to create a more resilient, secure, and predictable food supply to our urban areas.

This map indicates many of the potential sites that could be used for urban agriculture in NYC. The UDL is assessing the city's capacity for food production, and the distribution and retail environments for urban agriculture. This vital parts of the city's infrastructure is linked to key health and environmental services.

Source: MaPLUTO 2009,

Image: Urban Design Lab

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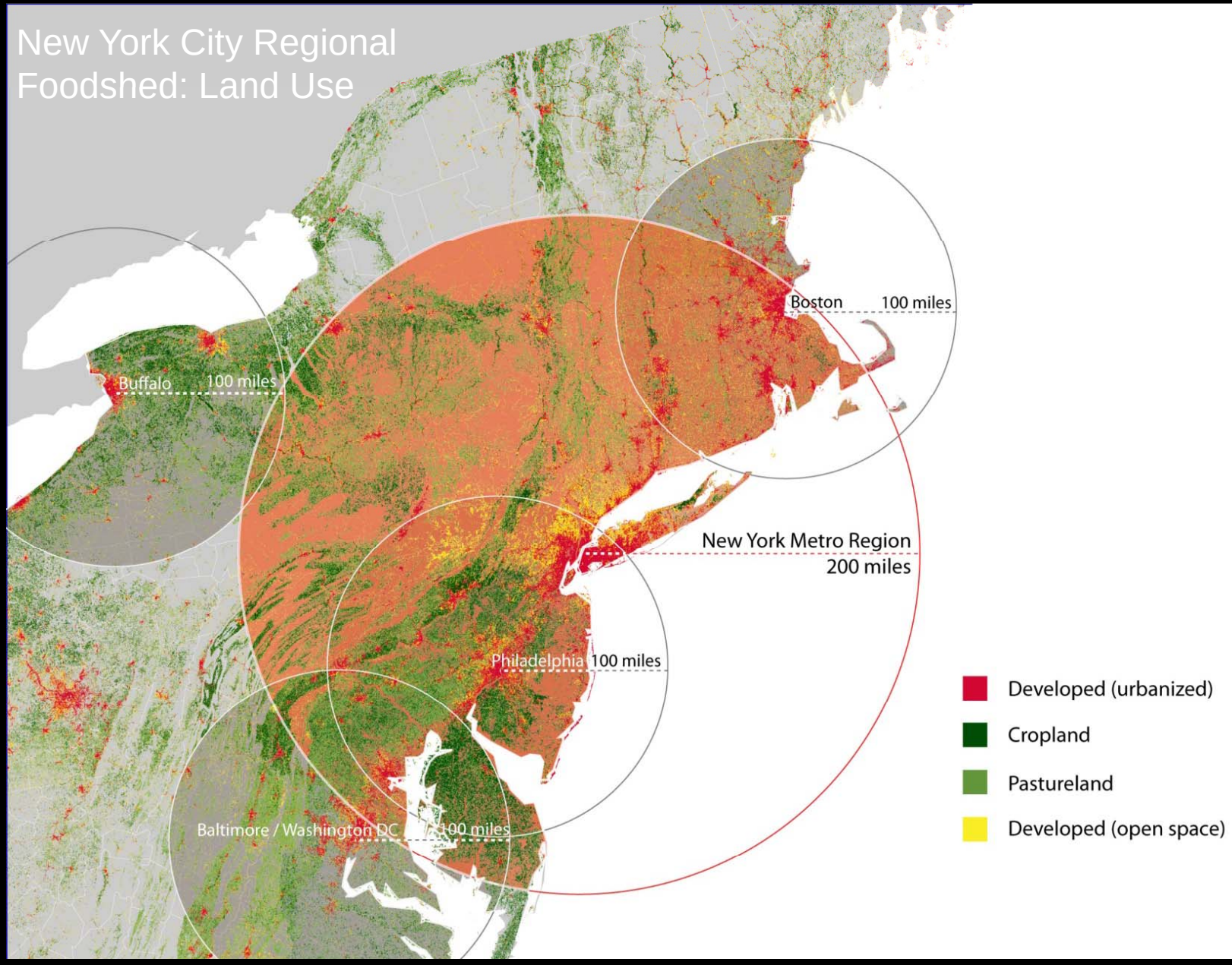

The UDL is accessing these components at a regional level. This involves a close analysis of the New York City regional food system. This research is taking place with the collaboration of the Stone Barns Center, with the aim of understanding existing capacity and future potential as a coherent system.

In order for such an approach to develop, we need to have a better understanding of the existing regional system and its future potential. For example, one of the primary factors in determining production potential is existing land use. This involves a consideration not only of existing capacity, but also, given the density of population in the region, potential for expanding the amount of land available for production: “developed open space,” which includes land such as parkland, may not be suitable for agriculture, but also includes a substantial amount of vacant or underutilized land around the major metropolitan centers.

Source: Multi Resolution Land Characteristics Consortium: National Land Cover Database.

Image: Urban Design Lab

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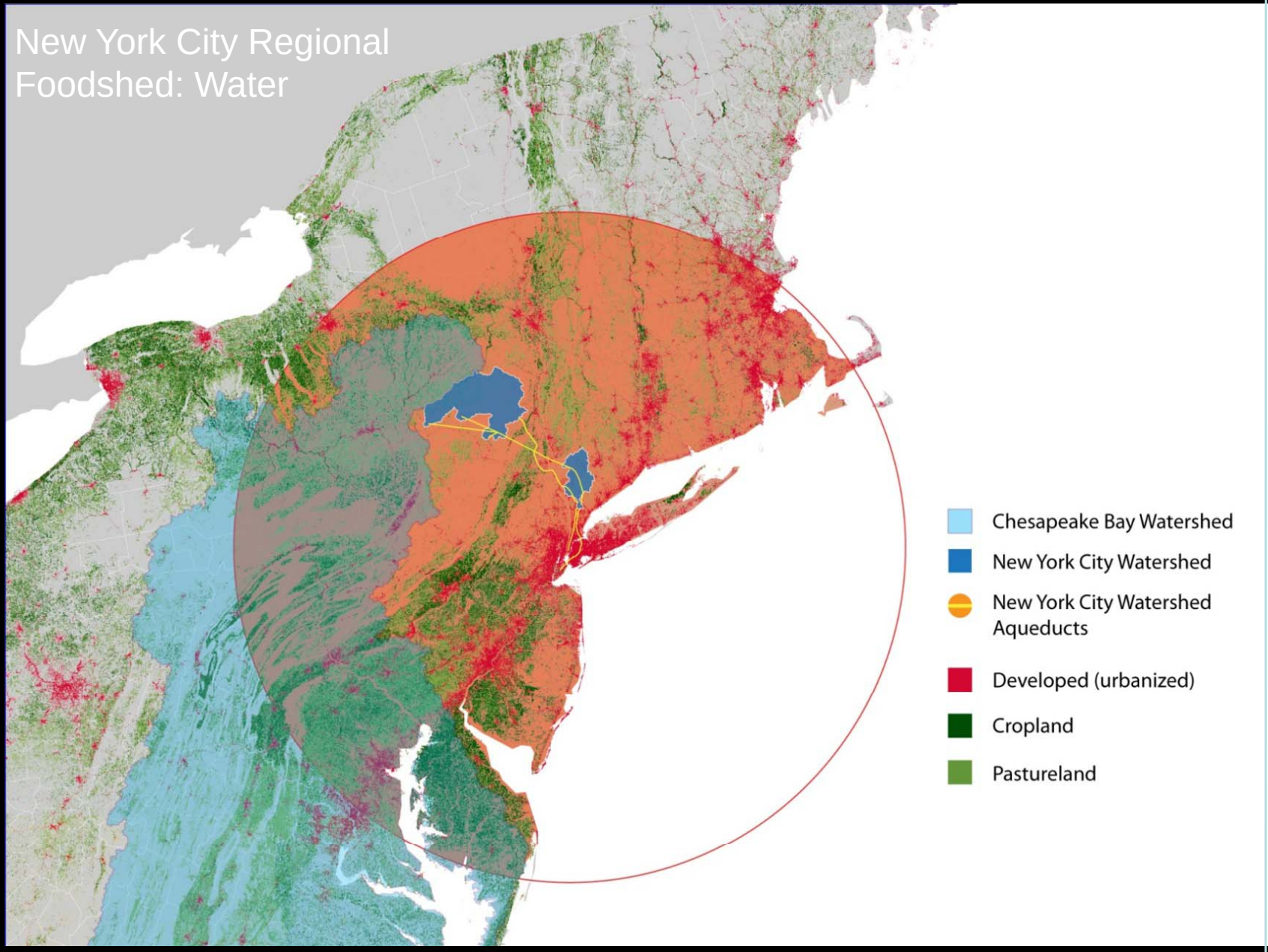
New York City Regional Foodshed: Water



Regional watersheds are an important analogy. The NYC watershed and the Chesapeake Bay watershed are two are particularly good examples of coordinated watershed management policies. What we are proposing is that city, state, and regional agencies come together to develop a similar approach to the food supply.

Source: Multi Resolution Land Characteristics Consortium: National Land Cover Database.

Image: Urban Design Lab

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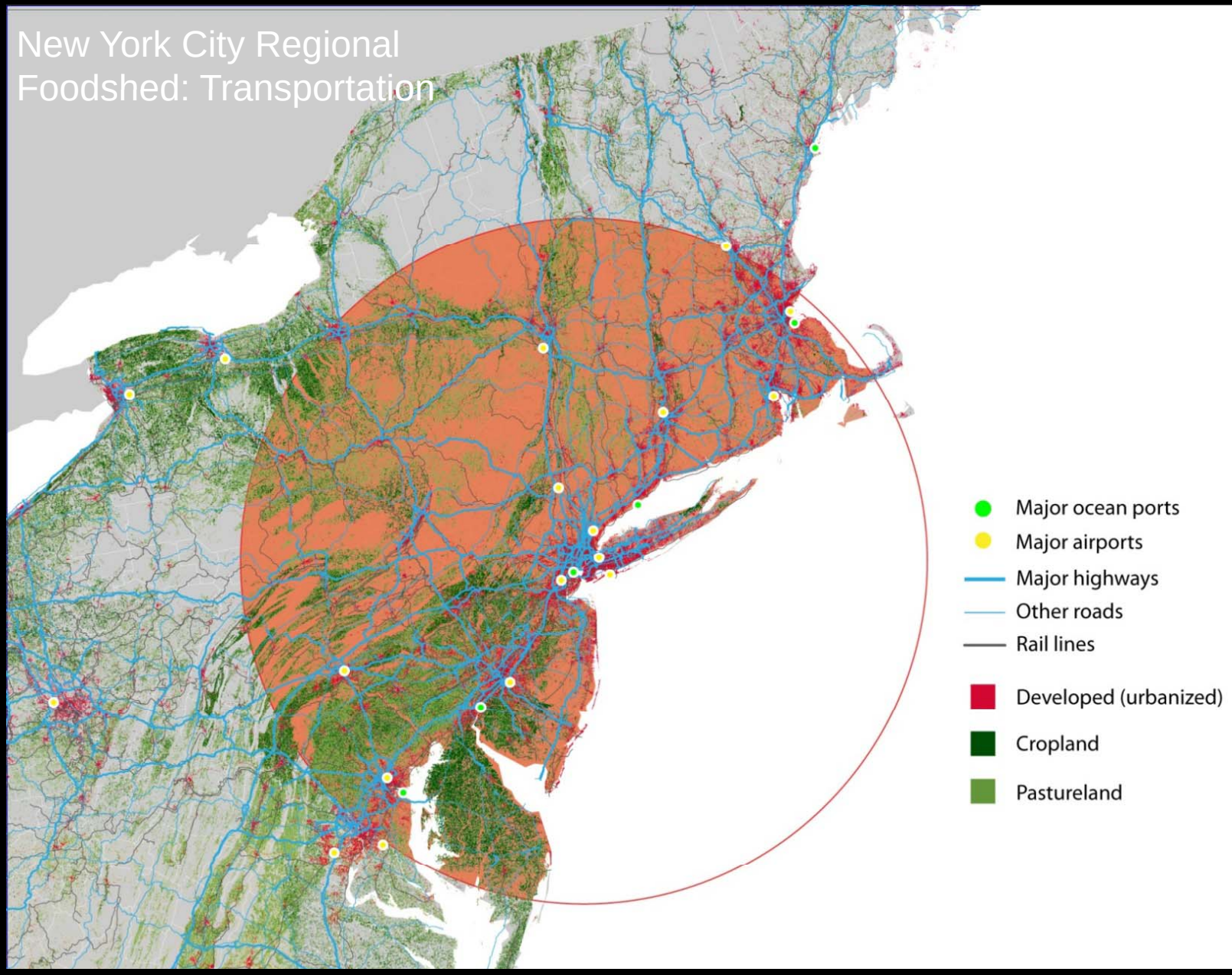
New York City Regional Foodshed: Transportation



Production is just one piece of the food system puzzle. We know from our preliminary research that the primary barrier to developing a more regionalized system is the existing transportation and distribution infrastructure.

Source: Multi Resolution Land Characteristics Consortium: National Land Cover Database; Department of Transportation: National Highway Administration. Image: Urban Design Lab

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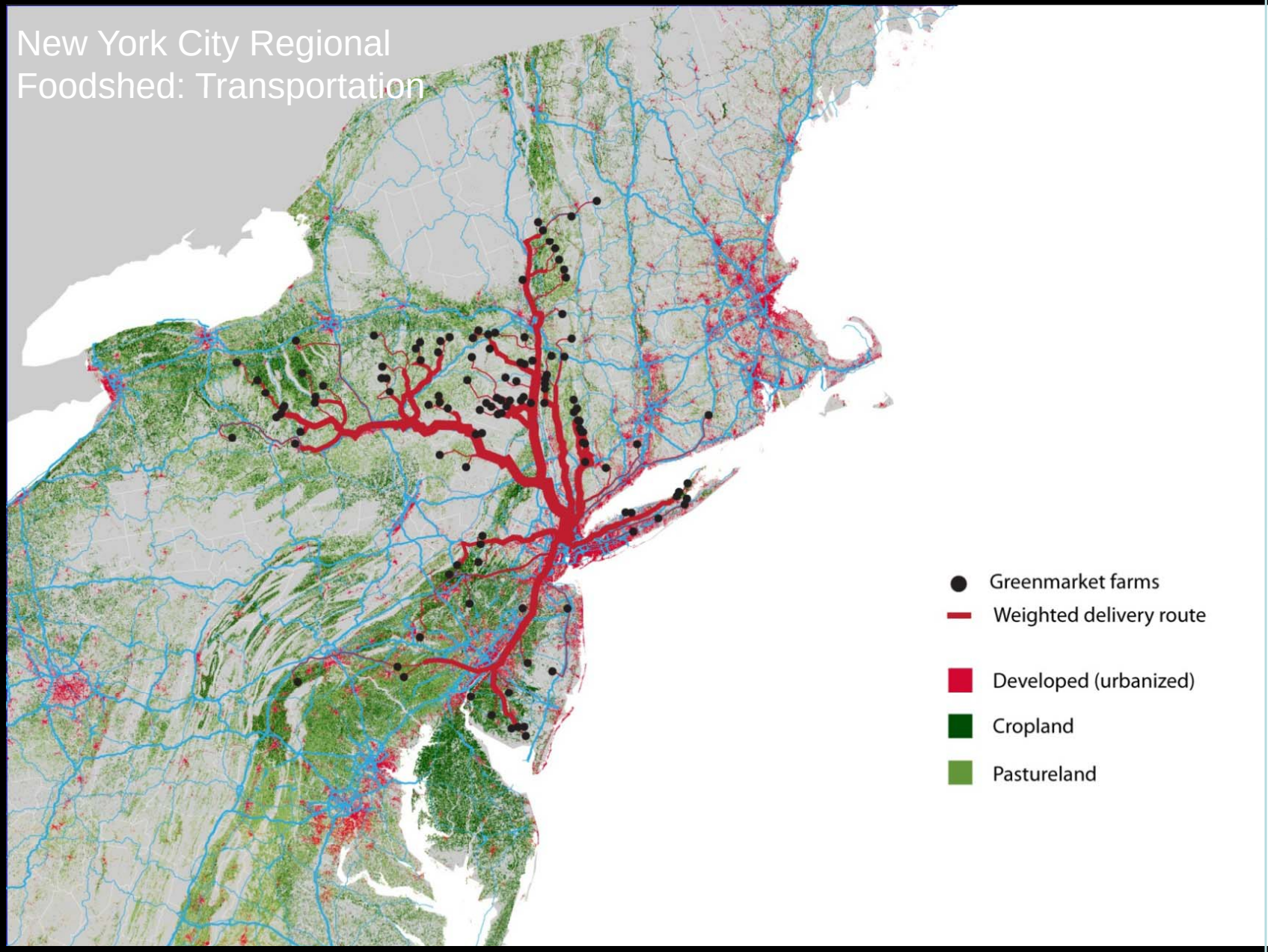

Much of the food comes into NYC by truck, but also rail, air, and ship, and we're currently analyzing the data on truck flows into the city, to see if there are existing nodes of transportation infrastructure that could be adapted to support a more regional system.

Source: GrowNYC Greenmarket Program..

Image: Urban Design Lab

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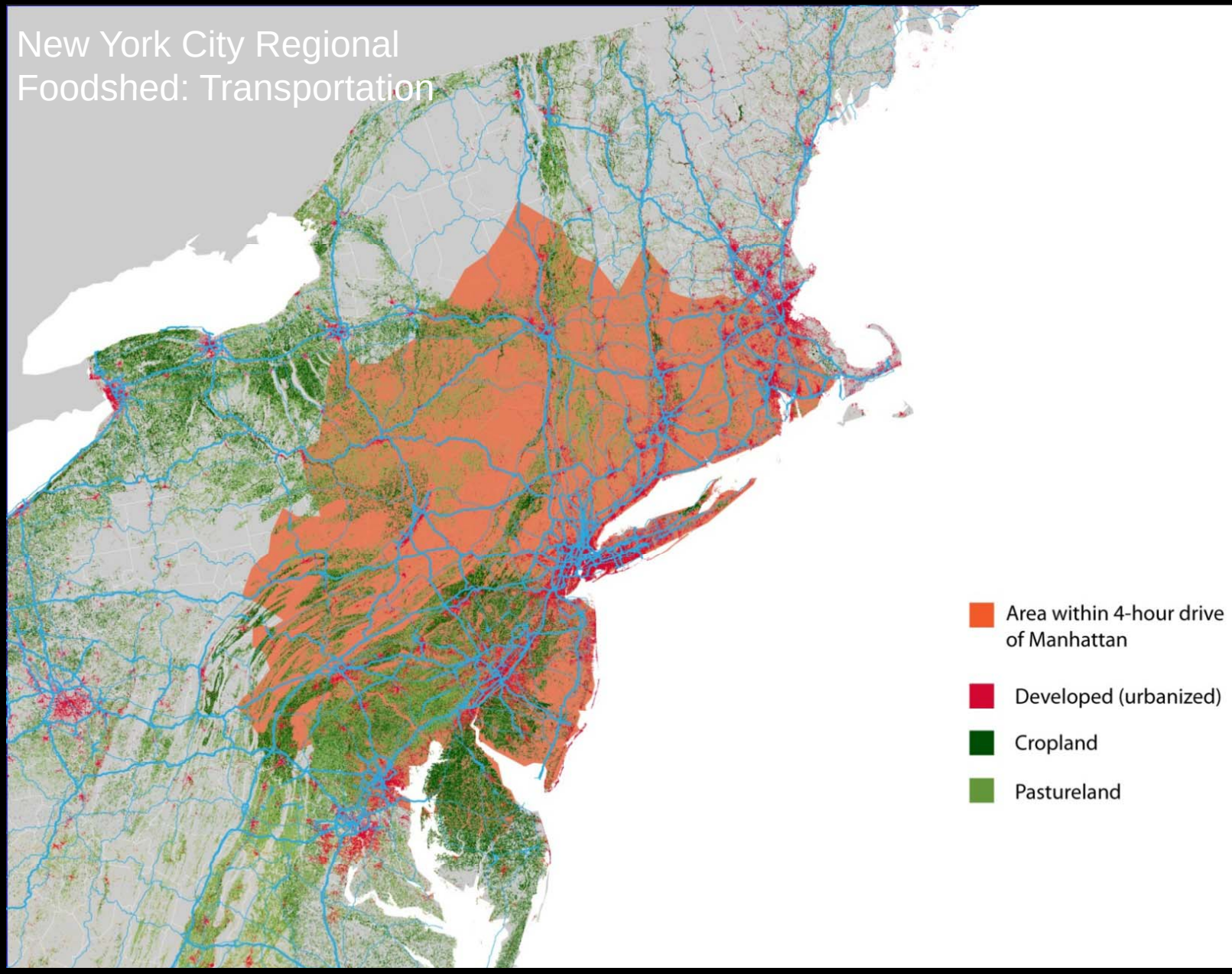
New York City Regional Foodshed: Transportation



Drivetime maps are being developed to transform the concept of the foodshed to incorporate a more accurate understanding of food transportation.

Source: Multi Resolution Land Characteristics Consortium: National Land Cover Database.

Image: Urban Design Lab

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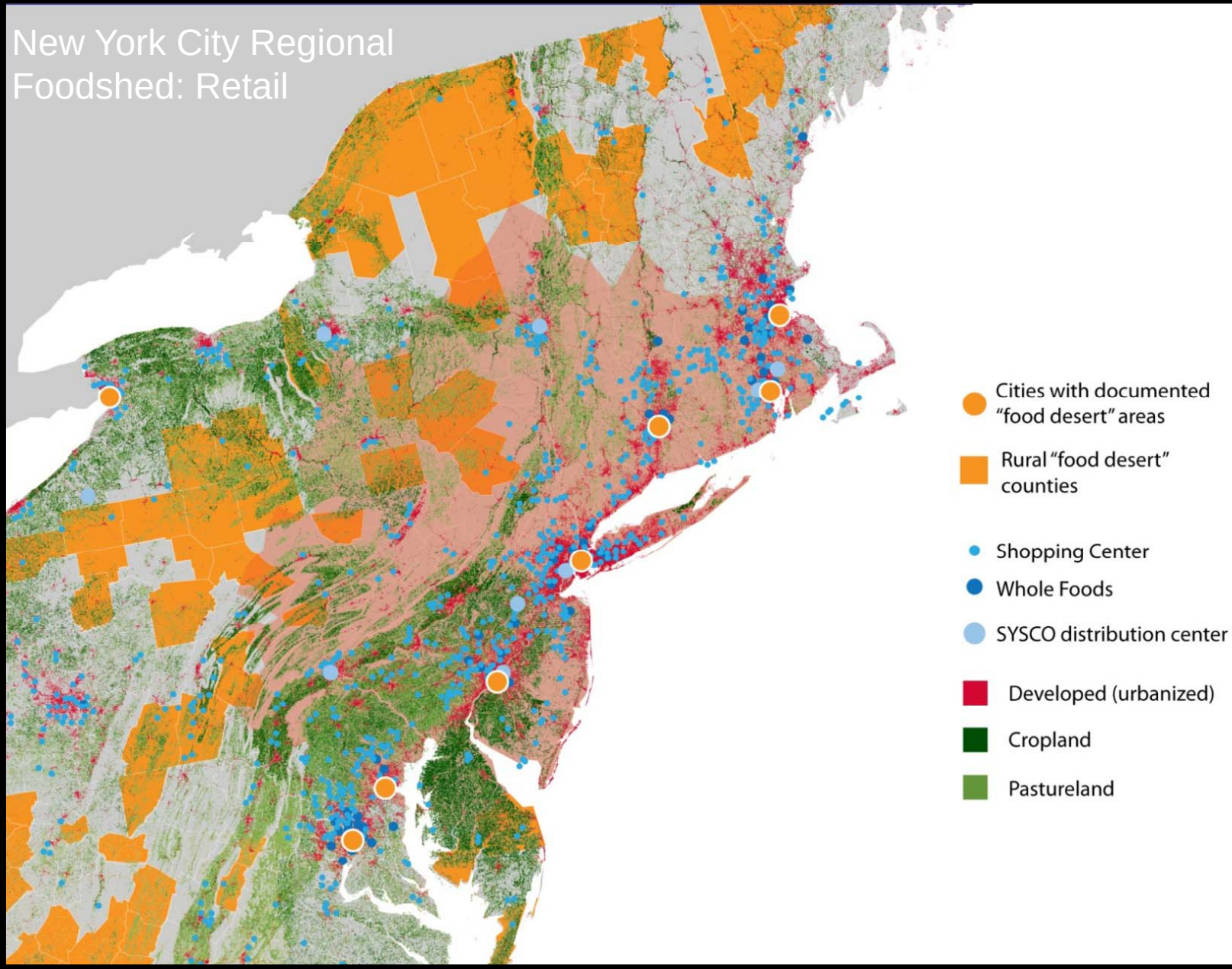
New York City Regional Foodshed: Retail



Retail is a critical piece of the regional food system. A better understanding of the regional retail environment is needed, focusing not only on where demand is concentrated but also where need is concentrated. Rural food access must be addressed as well as urban food deserts to reintegrate rural and urban economies.

Source: Blanchard, T.C., 2002. "Retail Concentration, Food Deserts, and Food Disadvantaged Communities in Rural America"

Image: Urban Design Lab

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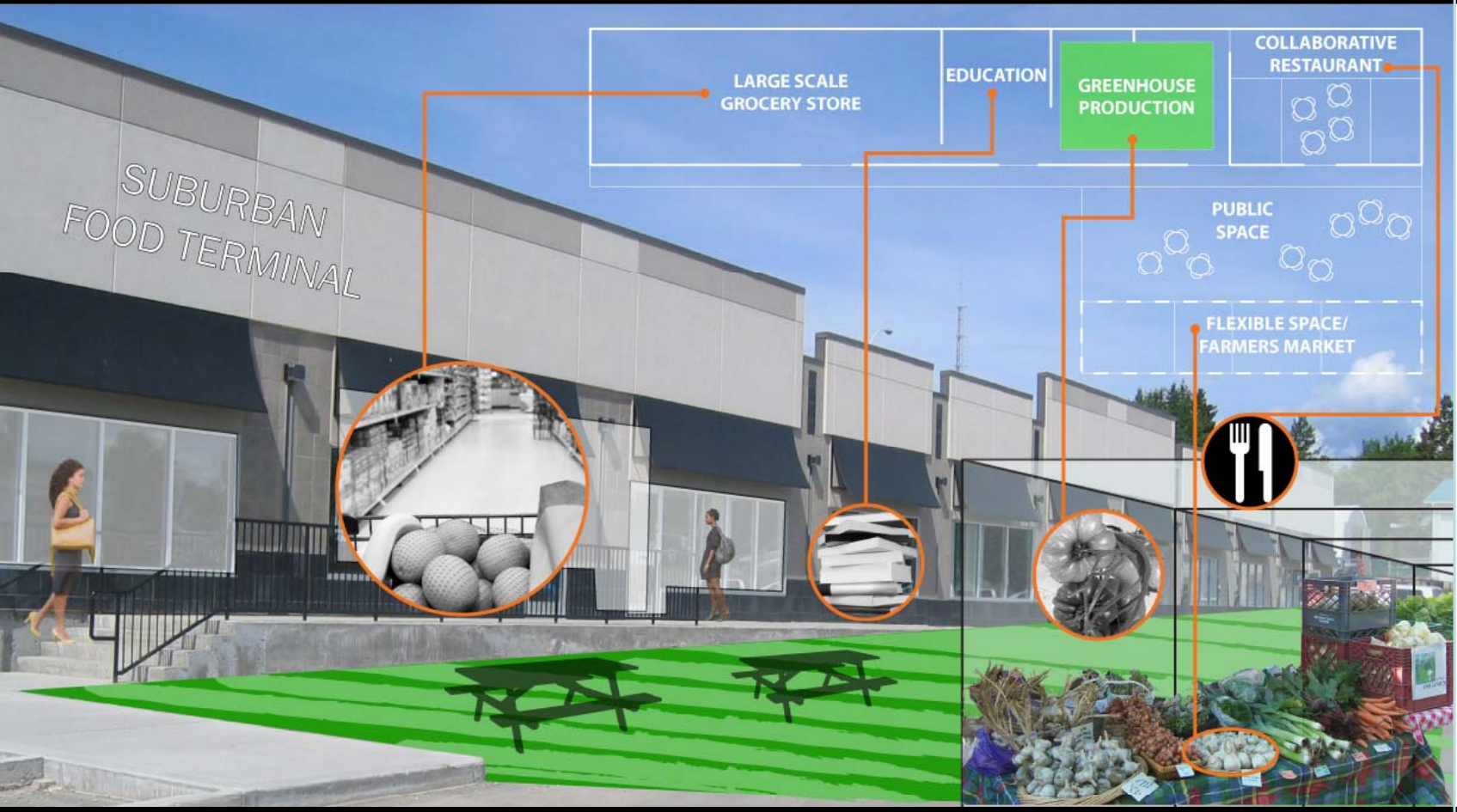

There are many opportunity for expanding food retail access, including the work of organizations like the Food Trust in Philadelphia, as well as through unconventional partnerships or retail models that take advantage of the increasing amount of vacant commercial property in suburban areas. This idea is already being developed in places like San Diego, where there are plans for a fresh food distribution center that includes an educational component and a health clinic.

Image: Urban Design Lab and MIT Collaborative Initiatives

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There are also opportunities for new retail models in urban areas, particularly in low-income neighborhoods, where standard retail business models often don't accurately assess demand. Some retailers have been exploring the idea of establishing smaller footprint stores linked to food production and farmers markets as a way to educate and attract customers.

Image: Urban Design Lab and MIT Collaborative Initiatives

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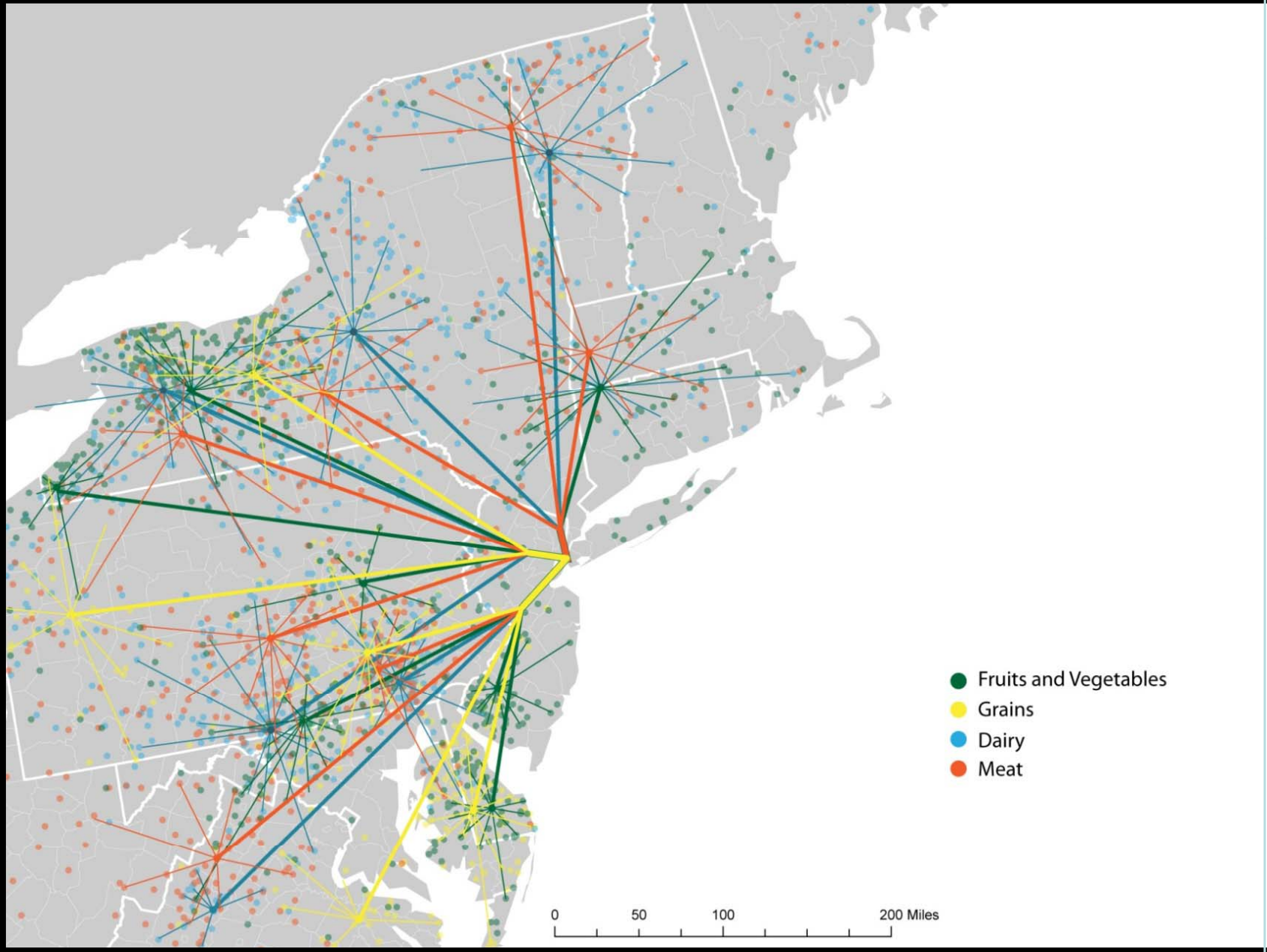

Ultimately, if we are to develop a more robust understanding of the regional food system, we will have to start focusing on specific product and commodity flows, from production through retail.

The next step is to start to merge the land use and the production data, and to map processing facilities so we can go deeper into understanding the current conditions and what needs to change to increase regional capacity. For example, there is clear opportunity for establishing processing and distribution hubs for various commodities that would support the regional system.

Source: USDA Census of Agriculture, 2007.

Image: Urban Design Lab

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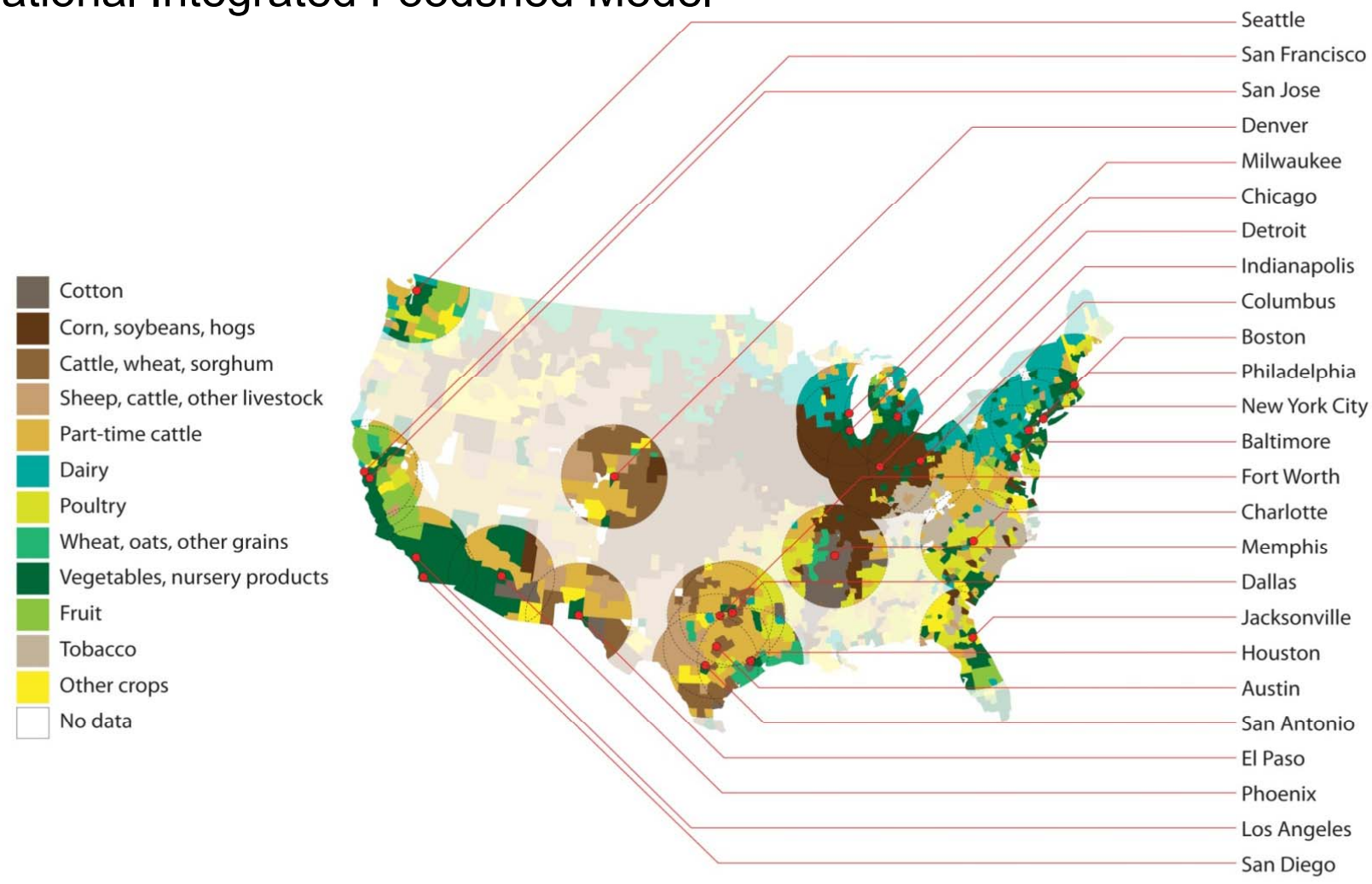
National Integrated Foodshed Model



USDA multicounty agricultural diversity clusters (patterns of agricultural production)

Research is also taking place at a National level. We are partnering with the Collaborative Initiatives at MIT to assess the opportunities for regionalization nationally. All of this work serves to help develop a foundation for more healthful and sustainable food systems, which has not only national but global implications.

Source: Sommer, Judith E. & Hines, Fred K. *Diversity in U.S. Agriculture. A New Delineation by Farming Characteristics*. United States Department of Agriculture Economic Research Service. Report Number 646. 1991 . Image: Urban Design Lab and MIT Collaborative Initiatives

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