Building soil:

Does it really take 500 years to make an inch of topsoil? Yes and no.

One inch per 500 to 1000 years is the rate at which natural weathering processes generally work to convert parent material (rock) to soil sized particles (sand, silt, clay).

Building up organic matter content and volume in your soil can be a far faster process, especially when some understanding and management are added to the mix.

Most of the solid (non water) volume of a plant is carbon, formed from carbon dioxide through the photosynthesis process. While growing a plant breaks down very little of the organic matter (carbon) in soil. If, once it is grown, it is cut down or trampled to the ground, where some of the carbon is metabolized by soil biology and some slowly converts to stable humus, that increases the soil volume without the addition of any more sand, silt or clay. This can take place at a much faster rate than 1 inch per 500 years. (The exact rate is a hotly debated topic at the moment since this is a form of carbon sequestration.)

Increasing the organic matter in soils through composting, chop-and-drop mulching, mob grading systems or intentionally burying organic matter, as in hugelkultur, has several other benefits.

The one that is the simplest to document is increased water holding capacity. For every 1% increase in total organic matter in soil it can hold an additional 1" of rainfall before becoming saturated. For my 45'x60' garden that works out to an additional 4,100 litres of rain water that can be retained on site for every 1% increase in organic matter. That is roughly 18 rain barrels worth of water.

There are many other benefits to increasing organic matter, including increased diversity in soil biology, which reduces the chances of any specialized pathogens becoming dominant, much like having a healthy and diverse microbiome helps protect humans from illness. Soil biology also works directly with plants to keep them healthy by holding any excess nutrients within the soil system (preventing nutrient leaching) and delivering macro and micro nutrients, as well as water, as they are needed by the plant. This is a two way partnership. A healthy plant will deliver up to 40% of the sugars that it produces through photosynthesis directly to the soil biology through root exudates. In addition to these sugars, organic matter is a critical component of a healthy soil system. If you can keep your soil biology healthy and thriving it can keep your plants healthy and thriving.

Some simple things you can do to help support your soil biology:

Feed it organic matter, compost, mulch, wood chips, chop and drop mulch, leaves etc.

Provide water during droughts. Soil biology can start to die off when the soil is too dry for too long.

Keep your soil covered. Exposed soil becomes compacted, even if it is never walked on, it needs a cover of plants or mulch to keep it from degrading and eroding. Cover crops can both protect soil and a source of additional organic matter.

Compost: The solution to almost every soil woe is composting, either in situ or starting it in a bin and then applying it to your garden. Compost improves drainage in clay soils, water holding capacity in sandy soils, reduces pathogen load, improves overall soil biology diversity and increases the availability of nutrients to plans.

For household scraps (which can be a challenge for urban gardeners) I've found the bokashi system to be effective for accelerating the composting process and drastically reducing any issues with odour, fruit flies and scavengers (squirrels and raccoons).

Popular nitrogen fixing plants in Permaculture that are invasive/becoming invasive in North America

Siberian Peashrub *Caragana arborescens*
Elaeagnus angustifolia *Russian olive*
Elaeagnus umbellata *Autumn olive*
Sea Buckthorn/Seaberry *Hippophae rhamnoides*
Black Locust *Robinia pseudoacacia* (this one is native to some areas and becoming problematic in others, research how it is behaving in your area before planting).

Native plants that fix high levels of nitrogen:

Dalea candida - white prairie clover
Hedysarum boreale - sweetvetch

Native plants that fix moderate levels of nitrogen:

Alnus incana - Gray alder
Alnus serrulata - Hazel alder
Amorpha canescens - Leadplant
Amorpha fruticosa - False indigo bush
Apios americana - Groundnut
Astragalus agrestis - Purple milkvetch
Cornus sericea ssp. *Sericea* - Redosier dogwood
Elaeagnus commutata - Silverberry
Hedysarum boreale - Utah sweetvetch
Lathyrus japonicus - Beach pea
Lespedeza capitata - Roundhead lespedeza
Lespedeza hirta - Hairy lespedeza
Morella pensylvanica - Northern bayberry
Shepherdia canadensis - Russet buffaloberry

Native plants that fix lower levels of nitrogen:

Alnus incana ssp. *Rugosa* - Speckled alder
Alnus viridis ssp. *Crispa* - Mountain alder
Astragalus canadensis - Canadian milkvetch
Baptisia tinctoria - Horseflyweed
Ceanothus americanus - New Jersey tea
Comptonia peregrina - Sweet fern
Dalea purpurea var. *Purpurea* - Purple prairie clover
Desmodium paniculatum - Panicledleaf ticktrefoil
Dryas drummondii - Drummond's mountain-avens
Glycyrrhiza lepidota - American licorice
Gymnocladus dioicus - Kentucky coffeetree
Hedysarum alpinum - Alpine sweetvetch
Myrica gale - Sweetgale
Oenothera pilosella - Meadow evening primrose
Oxytropis splendens - Showy locoweed
Vicia americana - American vetch

Source https://plants.usda.gov/adv_search.html