



RESILIENT NYC COMMUNITY GARDEN GUIDE

Practical tips to make your garden **more resilient**.

Step-by-step guidelines to **minimize damage** to your garden
before and after a storm.



A PROJECT OF GROWNYC, www.GrowNYC.org

ABOUT THIS GUIDE

SUPERSTORM SANDY came as a surprise to so many New Yorkers and lack of proper prevention exacerbated its impact. As weather incidents are more frequent, it is important that we take simple steps to minimize damage and have access to information that will help our green spaces get back online, serving New Yorkers.

GrowNYC is committed to creating a healthier, more resilient city for all of us by providing free tools and resources any New Yorker can take advantage of to improve their community. We hope this toolkit helps you to steward your green space responsibly and to ensure enjoyment for years to come thanks to sound design and preparedness.

We've outlined what to do before and after a major storm or other weather event so that you will be better prepared. From preventive pruning techniques to ways to secure garden features, we hope this guide will serve as a practical resource for you and your green space.

QUESTIONS? PROJECTS?

Contact us anytime at greening@grownyc.org

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COVER: El Sitio Feliz Garden at Union Settlement in East Harlem, shown shortly after Hurricane Sandy (top) and after rehabilitation (bottom).

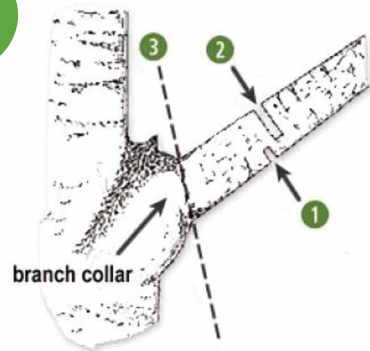
LEFT: A deciduous Privet (*Ligustrum vulgare*) hedge can provide wind protection to a neighboring garden.



PREVENTIVE PRUNING

SIGNIFICANT DAMAGE can occur from tree limbs or entire trees that come down in wind, snow or ice storms. Corrective pruning may be the most important thing you do to prevent major damage or even disaster. Dead, broken or damaged branches, trees with spindly branches or weak crotches (a branch with a very narrow angle between the trunk and the branch) are more likely to crack or break. Pruning can prevent damage to the tree, garden, fencing, surrounding areas or even passersby.

how
to



USE BY-PASS pruning shears to prune branches less than $\frac{1}{2}$ inch in diameter that can be reached standing on the ground. For larger branches use a folding tree saw. Large heavy limbs should be pruned using the 3 cut method (see diagram).

The first cut is an upward cut approximately $\frac{1}{4}$ of the way through the branch to prevent the bark from tearing. The second cut is downward slightly further out on the branch until the limb is cut all of the way through.

The third cut at the branch collar will

remove the remaining small stump leaving a clean, even cut that will heal quickly.

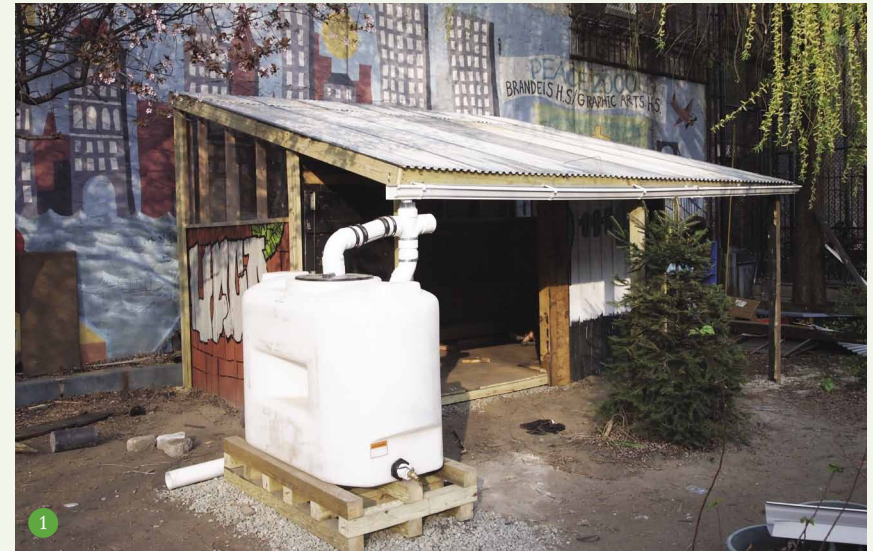
For branches up to 15 feet off the ground, the same technique can be used with a telescoping pole saw that can be adjusted to the branch height. Most pole saws include both an extended folding saw for larger branches and a by-pass pruner for branches less than $\frac{1}{2}$ " in diameter. Cuts are made using a downward pulling motion on the rope for the by-pass pruner or a sawing motion for the saw blade.

For large and higher branches professional tree care companies should perform the work. Most tree care companies will provide free estimates. Make sure to use a licensed and insured company.

Trees New York offers tree care classes for those interested in becoming a certified citizen pruner and learning more about pruning tools and techniques. www.treesny.org/citizenpruner

GREEN INFRASTRUCTURE

GARDEN ELEMENTS that can handle heavy rains and/or prevent flooding can protect against storm damage. Rainwater tanks can capture and store rainwater and also prevent flooding. Other green infrastructure techniques like permeable paving, rain gardens, and bioswales can slow flooding and prevent erosion and plant damage. GrowNYC's online toolkit includes how-to manuals, videos, designs and worksheets to help plan a Green Infrastructure project. www.grownyc.org/openspace/green-infrastructure-toolkit



RAIN WATER HARVESTING

Significant rainfall, wind, hail, sleet or snow can damage plants and structures in the garden. Rain water harvesting (RWH) ① in addition to providing a water source for gardens also conserves water, can prevent pollution by diverting rainwater from the sewage treatment plants and can prevent flooding in the garden. RWH can help alleviate wet or muddy conditions after a rainfall by absorbing and storing water that otherwise would cause these wet conditions.



PERMEABLE PAVING

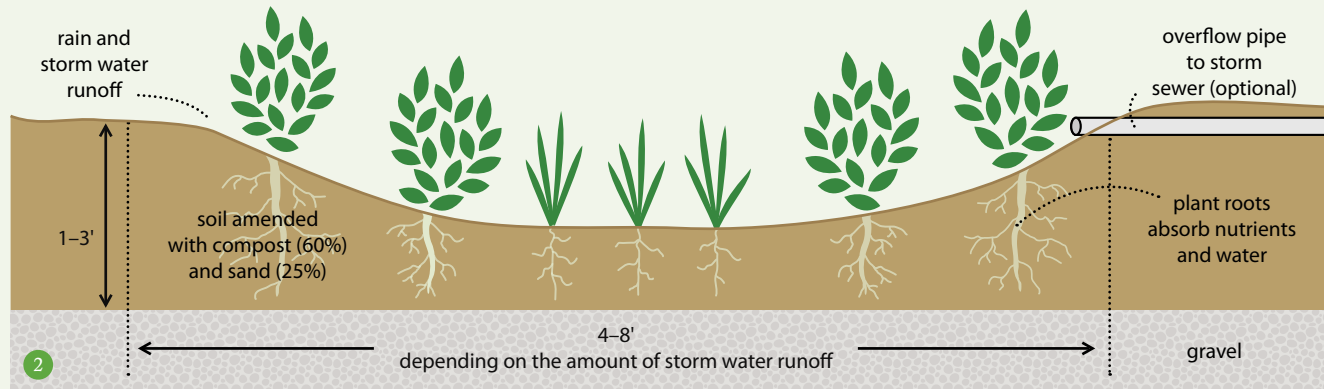
Permeable paving **1** is a paving material that allows stormwater to be gradually filtered back into the ground. This type of paving most often includes a hard permeable base of pervious concrete, asphalt, or plastic that allows the movement of stormwater down into a porous sub-base of stone or gravel. During a storm or flood, permeable

paving will handle excess water more effectively than conventionally paved surfaces, helping to substantially reduce runoff and erosion. In paved areas that frequently have flooding or puddles, consider replacing the regular pavement with permeable paving instead.

BIOSWALES AND RAIN GARDENS

Bioswales and rain gardens can absorb significant amounts of rainfall and prevent flooding throughout a garden. A rain garden **2** is a planted depression that is designed to absorb rainwater runoff from impervious surfaces such as paving and driveways. In times of heavy rainfall, storm water is directed into the rain garden's depressions where it soaks into the ground. Rain gardens can significantly reduce surface erosion and can successfully manage problem areas in gardens that regularly flood.

Specific rain garden plants can cope with wetland conditions, flooding (often for several days while the water is soaking into the ground) and drought. An extensive list of such plants can be found on Brooklyn Botanic Garden's website (www.bbg.org/gardening/article/rain_garden_plants).



COMMON RAIN GARDEN PLANTS

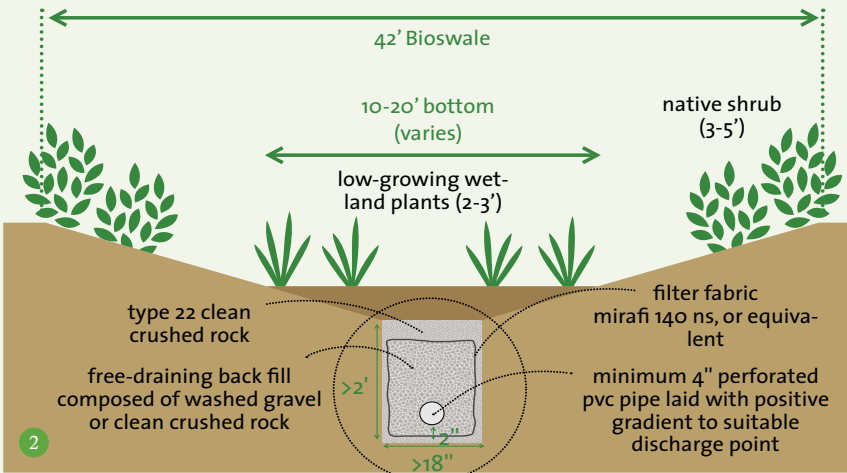
NATIVE PLANTS FOR SHADY RAIN GARDENS	NATIVE PLANTS FOR SUNNY RAIN GARDENS	RAIN GARDEN SHRUBS/TREES THAT DO WELL IN SUN OR SHADE
<p>MEADOW PHLOX <i>Phlox maculata</i></p> <p>IRIS <i>Iris versicolor</i></p> <p>WOODLAND PHLOX <i>Phlox divaricata</i></p> <p>BLUEFLAG <i>Iris versicolor</i></p> <p>FOAMFLOWER <i>Tiarella cordifolia</i></p> <p>FALSE DRAGONHEAD <i>Physostegia virginiana</i></p> <p>TURTLEHEAD <i>Chelone glabra</i></p> <p>MARSH MARIGOLD <i>Caltha palustris</i></p>	<p>NEW ENGLAND ASTER <i>Symphotrichum novae-angliae</i></p>  <p>CARDINAL FLOWER <i>Lobelia cardinalis</i></p> <p>GIANT SUNFLOWER <i>Helianthus giganteus</i></p> <p>BUTTERFLY WEED <i>Asclepias tuberosa</i></p> <p>BEEBALM <i>Monarda didyma</i></p> <p>PURPLE CONEFLOWER <i>Echinacea purpurea</i></p>	<p>AMERICAN CRANBERRY <i>Viburnum trilobum</i></p>  <p>WINTERBERRY <i>Ilex verticillata</i></p> <p>FRAGRANT SUMAC <i>Rhus aromatic</i></p>  <p>RED OSIER DOGWOOD <i>Cornus sericea</i></p> <p>BLACK CHOKEBERRY <i>Aronia melanocarpa</i></p>

TIP

Water collection and conservation can be as simple as tree mulching. A tree that has been mulched around the base can collect and absorb excess rainwater and prevent flooding in the areas around the tree.



A bioswale ¹ ² is a linear, sloped retention area designed to capture and convey water, while allowing it to infiltrate the ground slowly over a 24 to 48 hour period. The slopes are usually planted with native species similar to a rain garden. While rain gardens can be as small as 5 feet long by 5 feet wide, bioswales are linear and can be used in small or large sites.



A French Drain, often incorporated in constructing a bioswale, is a trench covered with gravel or rock, usually containing a perforated pipe that directs groundwater away from an area

PLANT SELECTION

PROPER PLANT SELECTION, especially trees, can alleviate the need for pruning and the cost of damages caused by fallen limbs or trees. Dwarf or ornamental shade or fruit-bearing trees whose maximum height is less than 30 feet and tree species that do not have weak wood or narrow crotched branches are good choices for a community garden.

SMALL WIND & STORM RESISTANT TREES

HOLLY*
Ilex species



TRIDENT MAPLE
Acer buergerianum

TATARIAN MAPLE
Acer tataricum

WINTER KING HAWTHORN*
Crataegus viridis
'Winter King'

GOLDEN RAIN TREE
Koelreuteria paniculata

CRAB APPLE
Malus species

JAPANESE TREE LILAC
Syringa reticulata 'Ivory Silk'

(*native to the East Coast of the United States)



WIND RESISTANT TREES

Because of their height, trees are more prone to storm damage than other types of garden plants. Varieties with a tapered trunk have a low center of gravity and may be more stable. And most trees that mature at a small size, such as Korean Dogwood (Cornus kousa), or Crabapple varieties (Malus sp.) 'Prairifire' or 'Centurion', resist wind damage due to their small profile. Before you plant, consider the maximum height that the tree will reach. For example, a 3 ft. oak tree from the nursery can grow to 80 feet. It is also important to consider the tree's placement within the garden. It is best to plant a tree in the northern end of the space so that it doesn't shade out the rest of the garden.

In addition to being wind resistant, the 'Winter King' Hawthorn (Crataegus viridis 'Winter King') ³, will liven up your garden in the winter with its bright, colorful berries.

NATIVE PLANTS

Native plants often have a better chance of survival in the event of a substantial storm, because they are better adapted to local conditions. Non-native trees can, and do, survive serious storms if they develop extensive roots and have adequate foliage density.

WIND BARRIERS

Barriers provided by hedges, such as deciduous ones like Privet (*Ligustrum vulgare*) or evergreen hedges like Leyland Cypress (*Cupressocyparis X Lelandii*), planted at the perimeter of the garden are an excellent way to prevent garden damage from high winds and airborne debris. Dense foliage such as hedge-rows planted along the perimeter of the property can cut wind velocity significantly. Boxwood, Japanese Euonymus, Privet, Leyland Cypress, and Arborvitae are several popular varieties of plants used in hedgerows.

SALTWATER INTRUSION

Very few if any trees or herbaceous plants will survive being inundated with salt water but several popular varieties of plants and trees are salt tolerant.

SALT TOLERANT TREES	SALT TOLERANT PLANTS
 <p>EASTER REDBUD <i>Cercis canadensis</i></p>	 <p>THREAD-LEAF COREOPSIS <i>Coreopsis verticillata</i></p>
<p>CORNELIAN CHERRY DOGWOOD <i>Cornus mas</i></p>	<p>ALUMROOT <i>Heuchera americana</i></p>
<p>THORNLESS COCKSPUR HAWTHORN <i>Crataegus crus-galli</i> var. <i>inermis</i></p>	<p>BLUE FLAG <i>Iris versicolor</i></p>
<p>WASHINGTON HAWTHORN <i>Crataegus phaenopyrum</i></p>	<p>ORANGE CONEFLOWER <i>Rudbeckia fulgida</i></p>
<p>OHIO PIONEER DOTTED HAWTHORN <i>Crataegus punctata</i> var. <i>inermis</i> 'Ohio Pioneer'</p>	 <p>WILD BERGAMOT <i>Monarda fistulosa</i></p>
<p>'WINTER KING' HAWTHORN <i>Crataegus viridis</i> 'Winter King'</p>	<p>MARSH FERN <i>Thelypteris palustris</i></p>
<p>GOLDEN RAINTREE <i>Koeleruteria paniculata</i></p>	<p>EASTERN PRICKLY PEAR <i>Opuntia humifusa</i></p>
<p>CRABAPPLE <i>Malus species</i></p>	

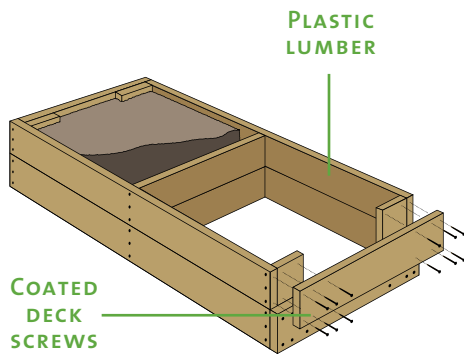
Salt tolerant trees Source: Cornell University Department of Horticulture www.hort.cornell.edu/uh/outrreach/recurbtree/pdfs/11salttol.pdf;
Salt tolerant plants source: Source: New York Botanical Garden www.nybg.org/planetalk/2013/03/tip-of-the-week/storm-clean-up-101-salt-tolerant-plants



RECYCLED PLASTIC LUMBER

RECYCLED PLASTIC LUMBER is an option for outdoor decking and molding, and an alternative material for building raised garden beds and garden furniture. Several features of plastic lumber make it a more storm resistant material than most traditional wood options.

ROT RESISTANCE Unlike pine or whitewood boards, recycled plastic lumber is rot resistant and will withstand flooding more readily than wood. Red cedar, a rot-resistant wood that is popularly used for raised beds, can only be expected to last five years when it is in contact with the soil. By comparison recycled plastic lumber can be expected to last for decades. These raised beds ① at Martin Luther King Jr. Community Park were built with recycled plastic lumber over twenty years ago and continue to show few signs of wear.

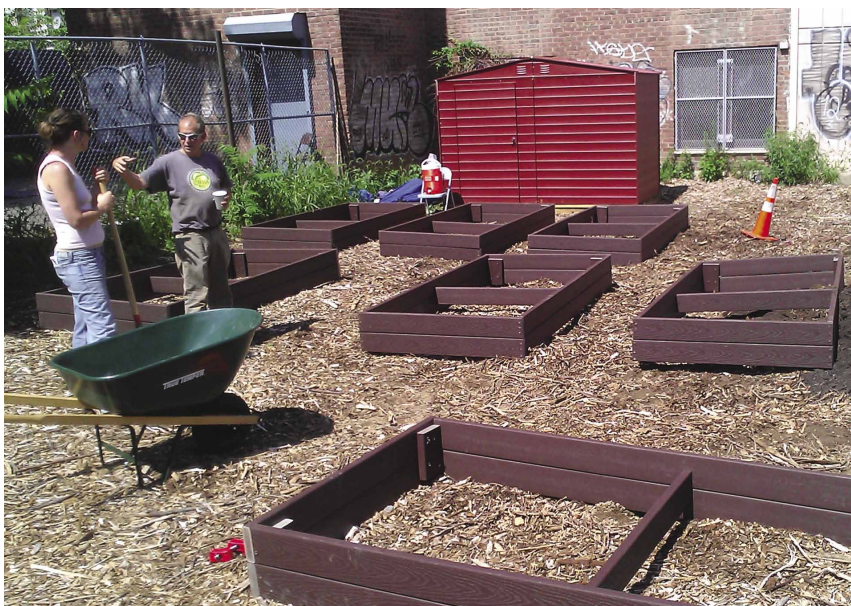


STURDY Recycled plastic lumber is heavier than most woods, making it much more difficult to displace during a storm or flood. Also, because recycled plastic lumber does not retain water in the same way that wood boards do, it can often be reused after a storm in situations where wood would not be reused. Plastic lumber is not susceptible to insect damage, it is resistant to cracking and splitting, and it does not need to be stained, varnished, or painted.

ENVIRONMENTALLY FRIENDLY An example of “upcycling,” the lumber is made entirely from discarded and recycled plastic and in some cases sawdust waste material.

ABOVE: An exploded diagram of a planter made of recycled plastic lumber.

BELOW: A community garden with multiple raised beds made of recycled plastic lumber.

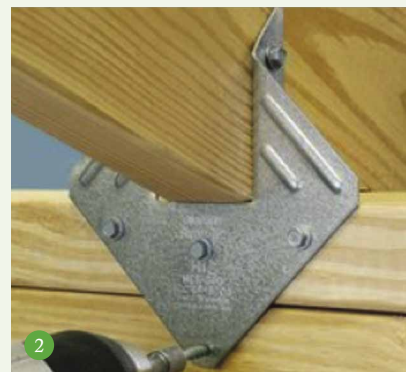


STORM RESISTANT STRUCTURES

STRUCTURES IN THE GARDENS (sheds, shade structures, casitas) should be constructed using proper building techniques to make sure they can withstand wind, rain, snow and floods.

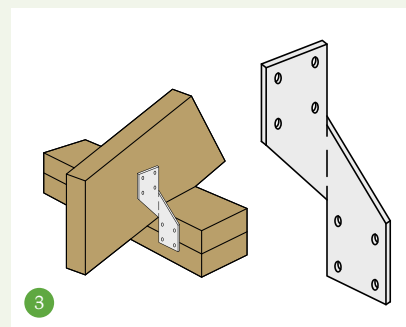


All structures should be securely anchored to the ground. Posts can either be set in concrete **1** or attached to concrete footings using post anchors. Check local codes (for local projects, check NYC Department of Buildings) for minimum depth for footings. The depth will depend on the type of structure being built and the soil type.



Your structure’s roof should be designed and installed securely. Joist hangers **2** or hurricane ties **3** are the most secure.

Use sufficient fasteners to prevent the roof from blowing off in the wind. Galvanized nails for asphalt and rolled roofing work well or use rust proof or galvanized screws to attach sheet metal.



All structures in the garden should be inspected at least once a year for signs of rotting wood, rusting metal, loose nails or screws, sagging roofs, etc. Any problems should be corrected as soon as possible.

STORM PLAN

IT IS IMPORTANT to develop and follow a storm plan that suits your specific garden with provisions to move valuable tools or supplies to a dry, protected location.

Be sure to meet with fellow garden committee members to review and amend the following step-by-step approach outlined below. Agree and delegate responsibilities to garden members.

1) ASSEMBLE A KIT A storm readiness prep kit with supplies such as rope, bungee cords, duct tape, tarps, chains, locks, nails, a hammer, scissors and a knife should be available or on hand for securing the garden from wind or flood. A hand truck or wheel barrow will be helpful for moving anything to a secure location. The kit should be kept in a well marked container and garden members should be aware of the location. A garden preparedness checklist should be prominently displayed (See box on page 13) and gardeners should discuss what needs to be done before emergencies.

2) SECURE GARDEN AMENITIES Objects that are floatable or easily displaced by wind should be tied down or otherwise secured before a storm. Usually there will be enough lead time before a storm for community gardeners to secure moveable objects in the garden and to move objects that may be damaged by flood or wind to higher ground or a more secure location if one is available.

Tables and chairs that could be blown around in a high



RIGHT: A rainwater harvesting system secured to its base.

wind can be secured by stacking them if possible or securing them to a fence or other strong structure. Garden tools, other materials and supplies can be covered with tarps, stored in a shed, or in strong metal or large plastic bins which should also be secured with tape. Tools will last longer if they are cleaned of any soil or other material, oiled and kept dry.

3) MOVE TOOLS AND SUPPLIES INDOORS

It is recommended when flooding is predicted or expected and gardeners have portable tools and other supplies, to temporarily move the most valuable items to a safe and secure place for storage. Arranging for such storage in advance will make this process happen more smoothly rather than having to first find a location to move the materials before the actual move.

TIP

In heavy snow storms, gently shake snow load off both broad (e.g. Rhododendron spp.) and narrow leaved evergreens (e.g. Taxus spp.) with a broom to prevent branch damage caused by snapping from weight of ice and/or snow.

PRE-STORM GARDEN CHECKLIST

- Coordinate with your garden's Storm Preparedness Team and delegate tasks accordingly.
- Assemble and/or create your Garden Storm Preparedness Tool Kits
- Secure garden furniture that isn't already anchored into the ground.
- Place tools and other loose supplies into a secure shed or other dry space.
- Remove any other items, such as tents, cold frame glass, portable grills or stoves, gazebo screens and garbage receptacles that could be damaged by heavy rains or wind or made airborne and cause damage.
- Live animal coops and cages should be secured and animals prepared in advance with sufficient food and water to get them through the storm.
- Harvest as much in advance as possible before flooding or heavy winds spoil fruit and vegetables.
- Use grommets and bungee cords to fasten down items too big or heavy to move.
- Lash hoop houses, cold frames or greenhouse structures securely to the ground with heavy rope over the roof frames and gables.
- When possible remove glass window panes or cover with plywood.



ABOVE: A tree felled by Superstorm Sandy at College Avenue Community Garden, Bronx.

4) PREVENTIVE PRUNING

To avoid greater damage, trim any obvious hazardous branches if the pruning can be done safely.

If your garden needs assistance when there is some kind of threat of a storm or other event that might cause damage to the garden, contact GrowNYC (www.grownyc.org) or GreenThumb, (www.greenthumbnyc.org) or look for updates on their websites.

POST STORM

When returning to the garden after a storm make sure to avoid any hazards such as dangling tree limbs, trees in danger of falling or holes or uneven pavement. Rope off the hazards to warn others to be cautious. Close the entire garden if necessary until problems have been fixed. Notify GreenThumb (www.greenthumbnyc.org) of any potential dangers.

If the storm caused flooding in the garden, do not eat any vegetables or

fruit that is left behind. Contaminated vegetables should be discarded, not composted. If the soil was inundated by water that contains pollutants, edible plants should not be grown for at least 6 months. Next get your soil tested. Add compost to the affected soil to introduce soil microbes that can process pollutants.

SOIL TESTING

It is very important to test your soil if it has been flooded before you grow food. Any of these institutions will test your soil. Visit their websites for instructions.

CORNELL NUTRIENT ANALYSIS
LAB cnal.cals.cornell.edu/

UMASS AMHERST
soiltest.umass.edu/

BROOKLYN COLLEGE
www.brooklyn.cuny.edu/web/academics/centers/esac/services/soil.php

POST-STORM GARDEN CHECKLIST

- Organize your Storm Recovery Team.
- Test your soil!
- Tie up branches in 2' bundles for curb-side pick-up after informing 311 or consider using them for art projects or rustic décor around the garden.
- If possible, chip plant debris for garden mulch or add to the compost pile (only if materials were not flooded by water that contains pollutants, eg. East River, Hudson River, Gowanus Canal).
- Gently tamp down roots that may have been heaved up or out of the soil.
- Check furniture and other free-standing structures for broken or loose parts. Make sure they are safe before resuming use.
- Support young trees (up to 2 1/2" in diameter) that have been blown over with guy wires and cedar stakes.
- Keep a storm calendar in the garden and chronicle your Storm Recovery Team planning and accomplishments in video, journals, logs or photos to better serve your groups needs when the next storm arrives.
- Once you're sure your soil is safe, plant!

PHOTO CREDITS

- Cover Ari Briski (top)
GrowNYC (Mike Rezny) (bottom)
- 1 Flickr user Sandy Richard
 - 2 <http://www.goodseedfarm.com/eventandblogimages/4611.jpg>
 - 3 GrowNYC (Lenny Librizzi)
 - 4 GrowNYC (Lenny Librizzi) (Permeable pavement photo)
Annemieke Beemster Leverenz (Rain garden diagram)
 - 5 Flickr user dmott9 (Cardinal flower)
Flickr user HorsePunchKid (Winterberry)
Flickr user milesizz (Red Osier Dogwood)
 - 6 Municipal Research and Services Center of Washington via
<http://www.lakecountyl.gov/Stormwater/BMPs/Pages/Bioswale.aspx>
(Bioswale photo)
Annemieke Beemster Leverenz (Bioswale diagram)
 - 7 Flickr user versicolor (Trident Maple)
<http://oregonstate.edu/dept/ldplants/crvirwk7.htm>
(Winter King Hawthorn)
 - 8 Flickr user CasualCapture (Easter Redwood)
Flickr user martius (Thread-leaf Coreopsis)
Flickr user milesizz (Wild Bergamot)
 - 9 GrowNYC (Lenny Librizzi)
 - 10 Annemieke Beemster Leverenz (Raised bed diagram)
GrowNYC (Shawn Connell) (Raised bed photo)
 - 11 <http://www.builditsolar.com/Projects/PV/EnphasePV/Post%20Anchor.jpg>
http://c0263062.cdn.cloudfiles.rackspacecloud.com/content/images/sized-prevent-hurricane-damage-roof-strongtie_9484568fd09298122ac57f50434272aa_3x2_jpg_300x200_q85.jpg
Annemieke Beemster Leverenz (diagram)
 - 12 GrowNYC (Lenny Librizzi)
 - 14 GrowNYC (Lenny Librizzi)



ABOUT GROWN NYC

FOUNDED IN 1970, GrowNYC is a hands-on non-profit which improves New York City's quality of life through environmental programs that transform communities block by block and empower all New Yorkers to secure a clean and healthy environment for future generations. Reaching two million New Yorkers every year, GrowNYC operates Greenmarket farmers' markets, engages New Yorkers in recycling education and resources, builds and maintains green spaces and engages young people in hands-on education. Helping residents make ours the most sustainable city in the world.

Donate, volunteer or get involved at www.grownyc.org