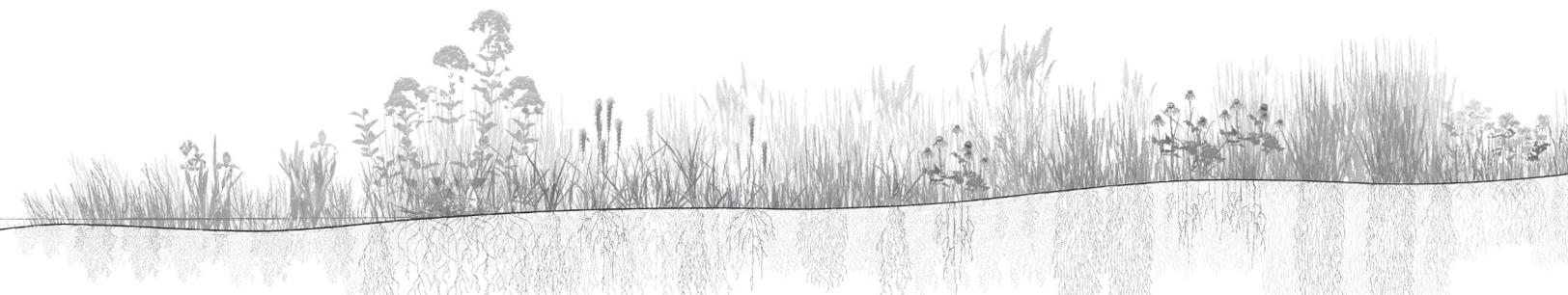


North Creek Nurseries
Landscape Plug Specification Manual
LP32 | LP50

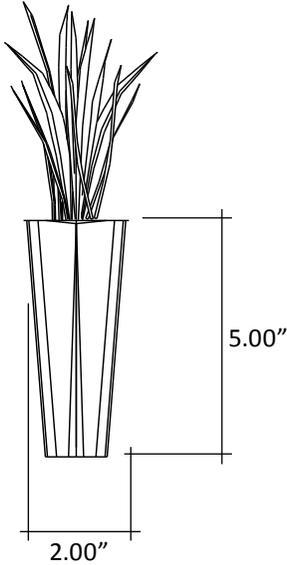


North Creek Nurseries, Inc.
388 North Creek Road
Landenberg, PA 19350
www.landscapeplugs.com
EcoPlug@northcreeknurseries.com
1-877-ECO-PLUG

Product Specifications Quick View

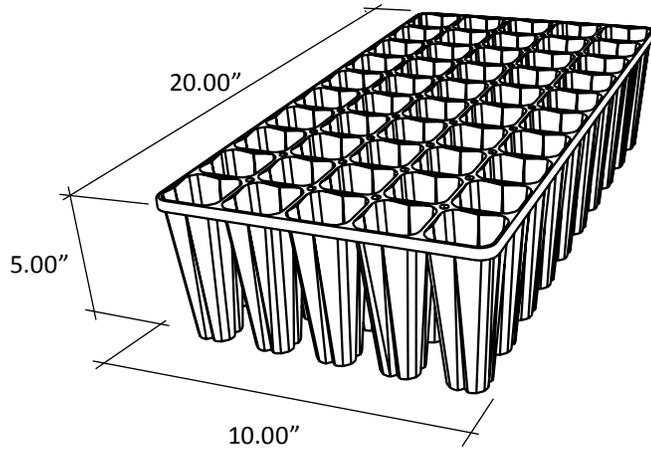
LP50 Plug Specifications

Cell depth: 5.00"
Cell width: 2.00"
Cell volume: 11.90 in³



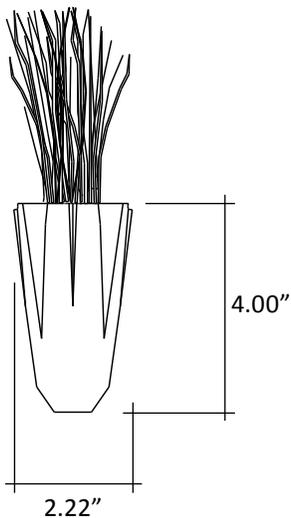
LP50 Tray Specifications

Cell-count: 50
Tray length: 20.00"
Tray width: 10.00"
Tray height: 5.00"



LP32 Plug Specifications

Cell depth: 4.00"
Cell width: 2.22"
Cell volume: 10.07 in³



LP32 Tray Specifications

Cell-count: 32
Tray length: 20.00"
Tray width: 10.00"
Tray height: 4.00"

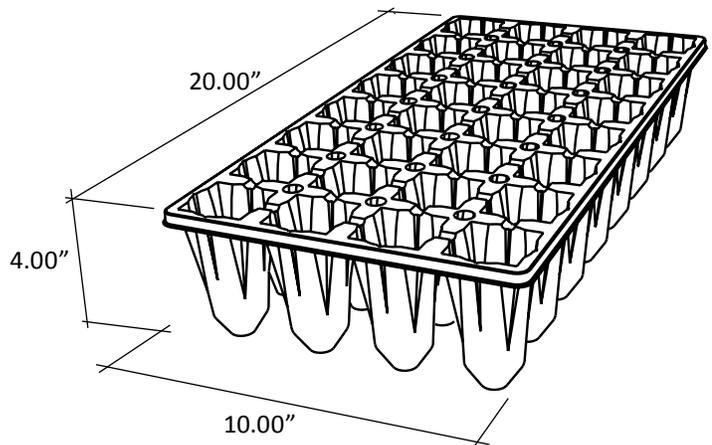


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North Creek Landscape Plugs - Definition

Landscape Plugs (LPs) are the minimum plant size needed to successfully transition nursery-grown plants into the landscape.

Landscape Plugs - History

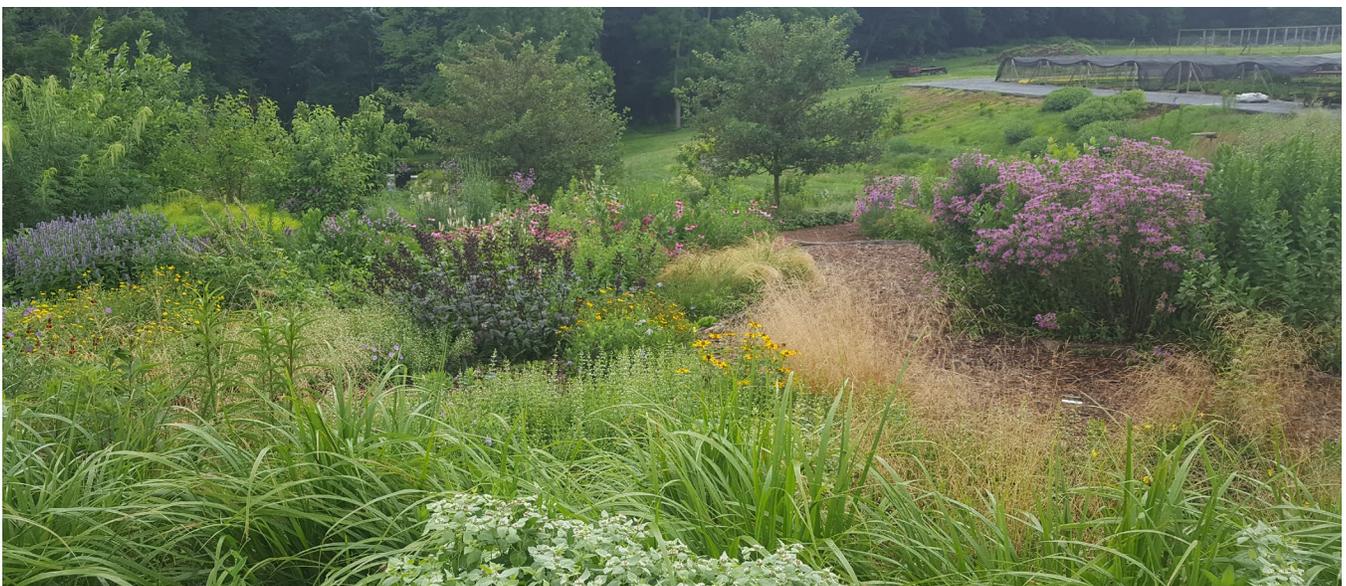
North Creek Nurseries introduced the first Landscape Plug to the market over 27 years ago. This revolutionary vehicle has facilitated the development and growth of stunningly beautiful, ecologically rich and highly functional vegetated environments. Since inception we have continued to improve performance and perfect design to the current specifications of two robust sizes, the LP50 and LP32 Landscape Plugs.

This document provides essential information on **why** and **how** to design and manage Landscape Plug projects. We've included lessons learned over years of growing and installing Landscape Plugs—to make working with them a breeze for you!



Landscape Plugs - Tried and True

All species we offer in LPs have been tested in our expansive trial gardens. Our Research & Development staff evaluates garden and landscape performance in a broad range of garden environments in the mid-Atlantic region. Only locally adapted species make it into our plant catalog. Furthermore, we evaluate the reproductive behavior of plants and ensure that the species we offer do not possess the potential to become invasive in our region.



Why Use Landscape Plugs?

Compliance with the Sustainable SITES™ Initiative and Beyond

Working with North Creek Nurseries will help you meet the SITES™ credit 5.10: Support Sustainability in Plant Production. By procuring plants produced by nurseries that comply with at least 6 of the 10 requirements outlined in Credit 5.10 in SITES™ V2, you may be able to earn up to 5 credits. Here is how North Creek Nurseries qualifies for this designation:

SITES™ Credit 5.10 Support Sustainability in Plant Production

North Creek Nurseries’ Sustainable Practices in Plant Production

Reduce use of potable water or other natural surface or subsurface water resources:	<ul style="list-style-type: none"> • Precise, automated boom irrigation systems • Micro-mist nozzles • Overnight pulse irrigation • Shading techniques • Highly efficient fog system for germination and propagation • Hand-watering based on plant needs/weather
Reduce runoff from irrigation	<ul style="list-style-type: none"> • See above for precision watering techniques in propagation and growing • 100% of irrigation and stormwater runoff is captured through our network of stormwater management and erosion control systems
Recycle organic matter	<ul style="list-style-type: none"> • All vegetation and other organic waste from our nursery production is composted on-site
Reduce waste	<ul style="list-style-type: none"> • LP trays use minimal plastic - no undertray • LPs require less soil media • 100% of consumables from offices and production are reused or recycled
Use Integrated Pest Management (IPM)	<ul style="list-style-type: none"> • General Manager is an IPM Specialist and oversees IPM strategies employed throughout all growing phases at nurseries • Neonicotinoid-free environment
Prevent use and distribution of invasive species	<ul style="list-style-type: none"> • A Systems Approach to Nursery Certification (SANC) Compliant nursery — 1 of 2 in PA; 1 of 7 in the United States • Publish industry and customer awareness updates on invasives • New Plant Introduction Policy focuses on regionally appropriate plants and prohibits adding invasive or potentially invasive species to our plant offering • Removal of invasive species in our gardens
Reduce energy consumption	<ul style="list-style-type: none"> • New greenhouse range doubled our production capacity and is 75% more efficient thus reducing energy use • X-pak wall-mounted boiler systems in free-standing poly houses 95% AFUE
Use renewable energy sources	<ul style="list-style-type: none"> • We have purchased “green”energy from our local provider in the past. We currently use natural gas and biogas
Provide safe and fair working conditions	<ul style="list-style-type: none"> • Monthly Safety Committee meetings • Lean Management principles • SANC™ Certified Nursery • Community outreach and education • 401K and benefit packages; bonus program

Beyond SITES™

Additional North Creek practices that support and promote healthy plants, healthy people and a healthy planet



Vernalization: the process of propagating during summer months and overwintering plants in cold frames. This saves energy inputs, results in vigorous and climate-adapted plants and brings happiness to us and our customers. Ask us about other sustainability practices that go beyond SITES™.

Why Use Landscape Plugs?

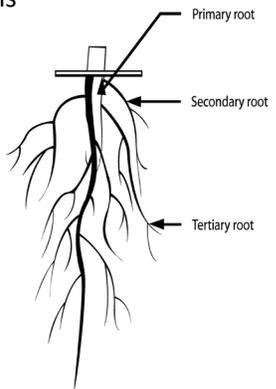
Accommodating Root Morphologies

Most herbaceous perennials fall under one of the following root morphologies:

Deeply Rooted Systems

Generally forb and grass species with taproots or deep fibrous roots

Examples:
Baptisia
Panicum
Asclepias



The diagram shows a cross-section of a plant's root system. A thick, vertical primary root extends downwards from the stem. From this primary root, several secondary roots branch out horizontally. From these secondary roots, numerous tertiary roots branch out further, creating a dense, fibrous network. Labels with arrows point to the 'Primary root', 'Secondary root', and 'Tertiary root'.

Laterally Rooted Systems

Generally more fibrous and shallowly rooted species, often but not always plants of the woodland understory

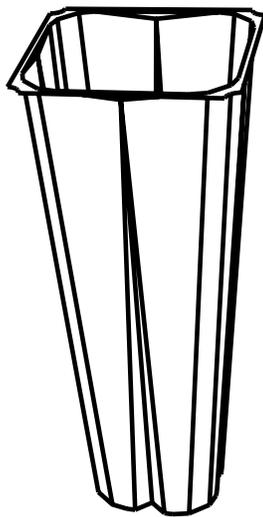
Examples:
Mertensia
Polystichum
Carex



The diagram shows a cross-section of a plant's root system. The roots are primarily horizontal and spread out near the surface of the soil. There are many fine, fibrous roots, but no single dominant taproot. The roots are densely packed in the upper soil layers.

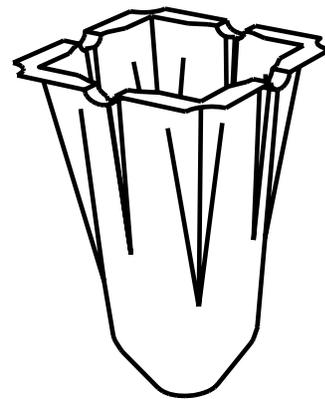
Individual plug chambers are designed to accommodate and encourage optimal root development for differing root morphologies, thus resulting in two distinct Landscape Plug sizes.

LP50 - Deeper and Narrower



See Appendix A – (p. 18)
for a complete list of deeply rooted
LP50 species offered

LP32 - Shallower and Wider



See Appendix B – (p. 20)
for a complete list of laterally rooted
LP32 species offered

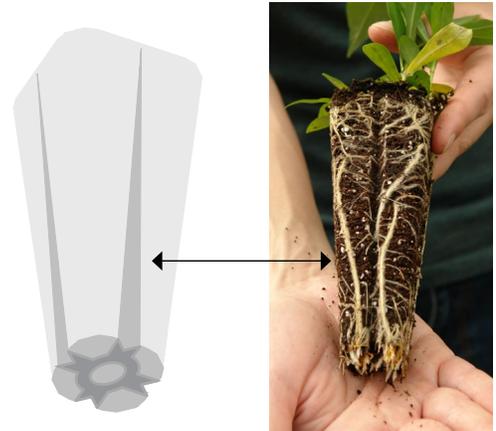
Why Use Landscape Plugs?

Root Guiding and Air Pruning

Root Guiding

Container grown plants can be subject to root circling, especially if a plant becomes root bound with age. Circling roots must be removed prior to planting to ensure a plant's roots leave the root ball, connect with the surrounding soils, and allow the plant to establish in its new location. The process of ripping or cutting apart circling roots can massively damage a plant's foundation. The process of healing and growing new supporting roots can set plant development back by several weeks. Prevention of root circling leads to quicker establishment on site as well as lower plant losses during the establishment phase.

Our Landscape Plugs are designed to prevent root circling by providing four recessed root channels – one on each side of every plug. Roots follow these guides straight down, preventing root circling altogether.



The LPs recessed root channels prevent root circling by directing root growth downward

Air Pruning

Air is a natural root barrier. Our growers take advantage of this fact by keeping the bottom of Landscape Plugs off the ground in our greenhouses. This air pruning technique prevents root clumps at the bottom of the plug. No roots will be damaged during the shipping process and plants arrive in excellent condition.



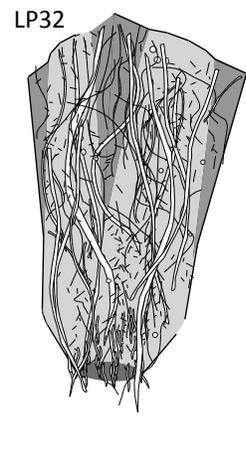
LP50



LP32



LP50



LP32

Landscape Plugs are naturally air pruned to prevent root circling and root damage during production, shipping and installation

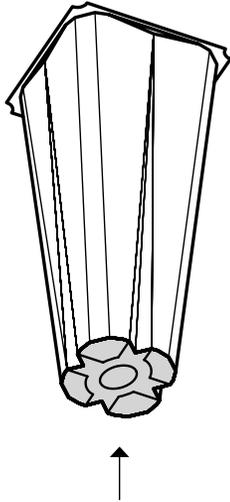
Why Use Landscape Plugs?

Easy Installation

Easy Installation

Landscape Plugs are designed to make working in the field easy for everyone. The tapered growth chamber and cross-hatched bottom design allows installers to easily push LPs out of their flats without damaging root systems. One key instrument used in extracting plugs is a landscape spatula.

This design is especially helpful when working with tender species or partially dormant plants. It helps prevent plant losses at the very beginning of a project.



The cross-hatched opening at the bottom of each LP50 cell secures growing media, maximizes root development, and protects from soil disturbance.



Why Use Landscape Plugs?

Landscape Plugs



Less Soil Media - Quicker Establishment

Higher soil volume is not directly proportionate to planting success. Our Landscape Plugs don't have the luxury of rooting into an abundance of ideal growing media. The soil media available to a plant within each cell is limited, encouraging them to up their game and root down deeply into surrounding native soil shortly after installation. The roots quickly connect with the surrounding soil providing the plant with water and nutrients. These guys are survivors!

More Cost Effective

Purchasing flats of Landscape Plugs is often much more cost effective than purchasing finished containers. The cost per plant is generally more economical, leading to an overall lower input cost and often a higher success rate!

Reduced Plastic Waste - Lower Shipping Costs

Landscape Plug flats are made from 100% recyclable material and arrive to customers in 32 (LP32) or 50 (LP50) plants per plastic flat, resulting in much less plastic waste! Landscape Plug flats are smaller and lighter than finished containers—typically require lower freight and handling costs—a win logistically, economically, and ecologically!

Easy and Efficient Installation

Landscape Plugs are quick and easy to plant. Installation holes are quickly and easily dug with various tools including, but not limited to, hand trowels, weeding knives, and augers. LPs are transported throughout a planting site with greater efficiency, and root channel openings at the bottom of each cell make removing single plugs effortless, while compact sizes help make planting projects easy, and shall we also say, fun?

Landscape Plugs vs. Finished Containers

Finished Containers



More Soil Media - More Time Needed for Establishment

Finished containers are often installed with considerable amounts of growing media around their roots. If soils on site are compacted or plants have been overly pampered by nursery growing media – that often differs substantially from plants reside in nature—plants may have difficulty pushing their roots through these less than ideal native soils. We have observed that, at times, finished container root systems sometimes continue to circle within the growing media instead of engaging and establishing into the native soils—even years after installation!

Higher Cost Per Plant

Larger container sizes are often more expensive per plant and do not necessarily translate to greater success rate, faster establishment, or faster client satisfaction!

More Plastic Waste - Higher Shipping Costs

Finished containers, which sometimes come with under-trays, may amass to a large volume of plastic waste upon project installation and completion. Larger containers contain more soil media, are heavier, and lead to higher freight and handling costs.

Cumbersome and Slower Installation

Finished containers are often heavy, cumbersome to maneuver in large quantities, and more time consuming to plant. They require larger holes to be dug and who has the time for that? At time, plants are only partially rooted, and result in soil media falling on the ground or left stuck in the bottom of the pot. Think of all the superfluous annoyances.

Why Use Landscape Plugs?

Landscape Plugs vs. Smaller Liner Plugs

Landscape Plugs

Vigorous and Healthy Root System – 100% Success Rate

We firmly stand behind and believe that our Landscape Plugs have the optimal and most applicable root size needed to make a successful transition from nursery to landscape. To prevent plant loss, we strongly advise specifying Landscape Plug dimensions to avoid having contractors substitute smaller plug sizes. A minimal root depth of four inches is essential for peak plant survival rates.

Deeper Plugs Hold Moisture Better

The top two inches of any soil media often dry out relatively quickly, but the bottom two or three inches of Landscape Plugs hold onto moisture for longer. While shallower liner plugs might dry out completely, LPs can remain moist—as well as alive and happy—in the same conditions.

Smaller Liner Plugs

Inferior Root Systems – Higher Plant Losses

If plugs with less than adequate root depth and soil volume—plugs smaller than 4 inches—are installed directly into the ground, instances of plant loss significantly increase. Inferior root systems result in unnecessary product replacement, additional labor costs, and avoidable client dissatisfaction.

Smaller Plugs Dry Out Quickly

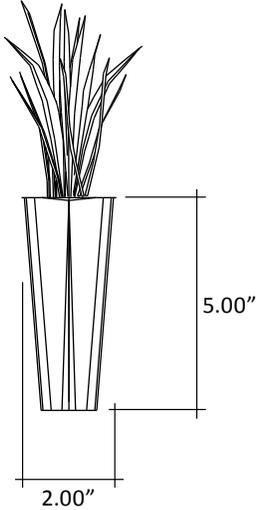
Smaller root systems are prone to drying out more rapidly than LPs. They require consistent, reliable and more frequent irrigation. The result is often higher plant mortality and an increase in the time needed for plugs to establish.

How to Use Landscape Plugs

Dimensions and Specifications

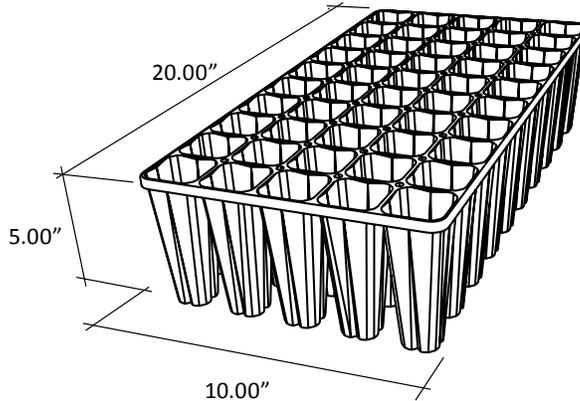
LP50 Plug Specifications

Cell depth: 5.00"
 Cell width: 2.00"
 Cell volume: 11.90 in³



LP50 Tray Specifications

Cell count: 50
 Tray length: 20.00"
 Tray width: 10.00"
 Tray height: 5.00"



Additional LP50 and LP32 Specifications

Trays and Cells

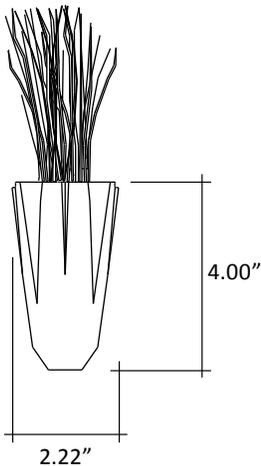
- Each tray cell includes root channels
- Each tray cell is tapered at the base
- Trays are constructed from 100% recycled and 100% recyclable material

Soil and Roots

- Fully developed root systems are air pruned
- Compliant with ANSI standards and Sustainable SITES™
- All nursery inputs are managed in accordance and compliant with the Systems Approach to Nursery Certification (SANC) protocol.

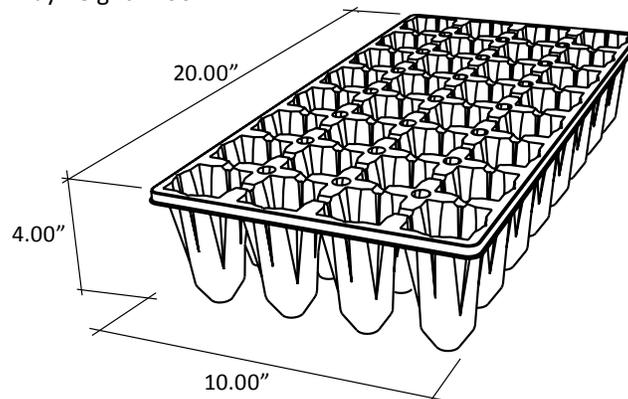
LP32 Plug Specifications

Cell depth: 4.00"
 Cell width: 2.22"
 Cell volume: 10.07 in³



LP32 Tray Specifications

Cell count: 32
 Tray length: 20.00"
 Tray width: 10.00"
 Tray height: 4.00"



How do LPs relate to ANSI container sizes?

LPs are compliant with ANSI plug standards and their volume falls between SP#1 and SP#2 container sizes.

Container Type:	ANSI SP#1	LP32	LP50	ANSI SP#2
Volume:	6.5-8 in ³	10.07 in³	11.9 in³	13-15 in ³
		Size (Small to Large) →		

Designing with LPs

Landscape Plugs can be the backbone of a perennial planting design. They can also be beautifully integrated with shrubs, trees or seed mixes. They are versatile and can withstand tough conditions, providing both aesthetics and a variety of ecosystem services. For assistance in selecting the most appropriate species for your project, please explore our Species Selection Chart. This chart allows you to find appropriate LP species based on various characteristics including:

- Soil Moisture Gradient and Wetland Indicator Status
- Bloom Time and Color
- Mature Height
- Hardiness Zone
- Optimal pH
- Attributes such as sun/shade tolerance, salt and deer tolerance, ability to control erosion, etc

Species	Common Name	WIS	Height	Hardiness	pH	Plant Attributes
<i>Scirpus validus</i>	softstem bulrush	OBL	6-8'	3-9	5.4-7.5	○ ● rh C3 🐇 ☼ E
<i>Typha angustifolia</i>	narrowleaf cattail	OBL	4-5'	3-11	3.7-8.5	○ ● rh C3 ☼ E
<i>Typha latifolia</i>	broadleaf cattail	OBL	4-5'	2-11	5.5-8.7	○ ● rh C4 ☼ E
<i>Carex comosa</i>	longhair sedge	OBL	4-5'	4-7	4.6-7.5	○ ● C3 ☼ E
<i>Carex emoryi</i>	Emory's sedge	OBL	18-24"	5-9		○ ● rh C3 E
<i>Carex lurida</i>	shallow sedge	OBL	2-3'	3-8	4.9-6.8	○ ● C3 E
<i>Carex stricta</i>	upright sedge	OBL	3-4'	5-8	3.5-7	○ ● C3
<i>Carex vulpinoidea</i>	fox sedge	OBL	2-3'	3-7	6.8-8.9	○ ● C3 E
<i>Acorus americanus</i>	sweetflag		3-4'	3-6	5.6-7.2	○ ● rh C3 E
<i>Asclepias incarnata</i>	swamp milkweed	OBL	3-5'	3-9	5-8	○ ● rh
<i>Caltha palustris</i>	yellow marsh marigold	OBL	8-12"	3-7	4.9-6.8	○ ● EP 🐇 E
<i>Hibiscus moscheutos</i>	crimsoneyed rosemallow	OBL	3-7'	5-11	4-7.5	○ ● ☼
<i>Iris versicolor</i>	harlequin blueflag	OBL	2-4'	2-7	6-7	○ ● ☼ E
<i>Iris virginica</i>	Virginia iris	OBL	2-3'	5-7	4.8-7.3	○ ● E
<i>Mimulus ringens</i>	Allegheny monkeyflower	OBL	1-3'	4-10		○ ●
<i>Carex muskingumensis</i>	Muskingum sedge	OBL	2-3'	4-8	4.7-6.9	● ● C3
<i>Chelone glabra</i>	white turtlehead	OBL	2-4'	5-8	6-7	○ ●
<i>Osmunda regalis var. spectabilis</i>	royal fern	OBL	4-6'	4-7	4.3-5.2	● ● rh 🐇

Above is a sample of the Species Selection Chart. Please contact us for the entire document.

Spacing with LPs

There is generally a gradient of spacing which is appropriate for any given site. The closer your spacing, the quicker gaps will be filled—alleviating issues such as soil erosion and weed pressure. Plant spacing should **not** be determined by container size but by considering many factors including:

- existing site conditions
- eventual plant height and spread
- plant morphology
- challenges (e.g.: weed pressure, steep slopes)

For specific questions on spacing, please contact our Ecological Sales team. We are working in our trial gardens to examine our LPs in the landscape over time so we are happy to discuss this further with you!

How to Use Landscape Plugs

Installation

Tips for Highest Survival Rates

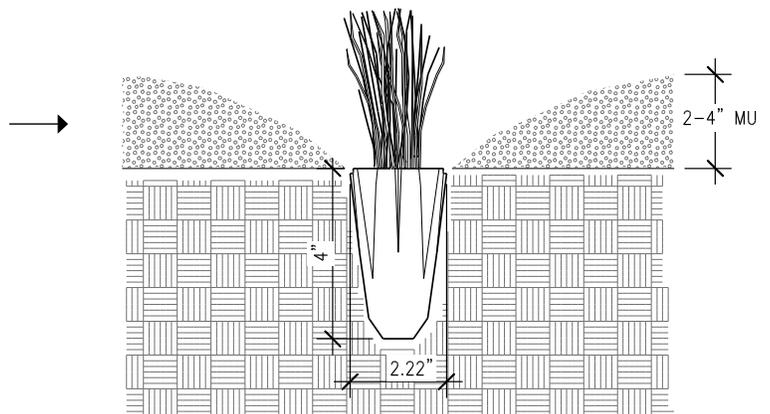
When to Plant

- Install LP50s and LP32s while they are in active growth only. Depending on temperature most species will break winter dormancy in early spring.
- Installation windows vary by species and plant metabolism—consult our ecological sales team for guidance on proper species selection.
- Installing outside optimal planting windows may require higher initial management inputs and result in plant loss.
- In order to plant efficiently and reduce soil compaction, monitor weather conditions and (unless planting into hydric soil) avoid planting if soil on site is too wet.



Site Preparation

- If planting into a dressing of mulch, apply prior to planting to save time. To protect plant crowns, only apply an appropriate layer of mulch (2-4”).
- Avoid all unnecessary soil compaction while preparing and planting the site (foot traffic, machinery, etc.).
- Water LP trays thoroughly prior to laying out design.
- Maintain the site’s hydrologic functions: <http://www2.epa.gov/polluted-runoff-nonpoint-source-pollution>.



How to Plant

- Remove plugs from trays by pushing up through bottom of liner.
- Do not pull the plant by the vegetative material.
- Do not ‘tease’ the root system apart.
- Ensure that native soil level evenly matches up to the top of the soil of the Landscape Plug.
- Tamp in soil around Landscape Plug to increase soil-root contact and minimize potential for frost heaving.
- Water immediately to reduce air pockets and maximize contact between LP roots and soil nutrients.



How to Use Landscape Plugs

Installation

Helpful Tools for Planting LPs



Earth Auger (3")



Power Drill with Auger Attachment (3")



Hand Trowel



Weeding Knife



Trenching Spade



Pick Axe



Dividing Up the Labor One technique often used for large scale LP plantings is division of labor: a crew member drills holes, a crew member (or designer) lays out the design, remaining crew members install plants, and a follow up crew member waters the plants in for proper establishment.

$$\text{Installation Rate} = \frac{120 \text{ Landscape Plugs}^{\text{TM}}}{\text{Labor Hour}}$$



How to Use Landscape Plugs

Installation

Working Through Common Challenges

Highly Erodible Sites

Steep, erodible sites can be challenging. Many of the species offered as Landscape Plugs are excellent at controlling erosion. However, like all other plants, they need a secure framing and strong start through the installation and establishment phase. To provide this footing and frame the planting area, we recommend using biodegradable erosion control matting or sowing a cover crop to help stabilize the site as LPs establish.

- Secure erosion control matting prior to planting.
- Plant Landscape Plugs through the erosion control layer.
- Consider using vernalized LPs to stabilize the soil more quickly.
- For more information, refer to our Species Selection Tool for appropriate species or contact our ecological sales team at: EcoPlug@northcreeknurseries.com.



Crews Unfamiliar with LPs

For crew's new to working with and installing Landscape Plug projects, it can be beneficial to spend a few minutes familiarizing the team with what LPs are and the installation process from start to finish. If you have questions about proper handling and installation techniques, please feel free to contact our ecological sales team for advice: 877.ECO.PLUG or EcoPlug@northcreeknurseries.com.



Initial Irrigation

For Landscape Plug success, we absolutely can't stress enough the importance of the first initial irrigation. Immediately after LPs are in the ground they should be thoroughly watered. Having a person water the area surrounding each individual plug not only saves water but delivers the irrigation more directly and efficiently to each LP than with a sprinkler system. This 'watering in' will diminish air pockets in the soil, allowing the roots of your LPs to connect with the surrounding native soil and establish more quickly and successfully!

In warm and sunny conditions it is helpful to also water the LP flats prior to planting to reduce the chance of drought stress while LPs wait for their important watering in.



Successful Landscape Plug Establishment

- Monitor the new planting on a regular basis for signs of diseases, pests and water stress.
- Irrigate as needed, but as infrequently as possible, until Landscape Plugs are well rooted and able to fully access groundwater resources.
- Keep planting free from undesirable species.
- If there are plant losses, replace plants with same or similar species as soon as possible. Planting areas left unvegetated will be at higher risk of weed invasion.



One of our North Creek rain gardens: LPs to blooms in less than one season!

Adaptive Management - Site and Species Monitoring

Even as your Landscape Plug installation matures, monitoring will continue to be crucial. Your project's long-term success depends on many factors including its management into the future! You will be happy to hear that the need for irrigation, weeding and mulching will lessen over time but you will be best prepared for any arising challenges if you continually observe how your planting evolves. If you have any questions about this, please contact us at EcoPlug@northcreeknurseries.com.

- As during establishment, monitor the planting regularly for signs of stress and weed pressure.
- Examine trends and patterns such as which species are thriving, which species spread and how, which species stay put and which species come and go.

Invasive Species Control

It is important to determine early on what plant species you consider undesirable and what tolerance you and your client have of these species. Strategically removing and cutting back these is key to success. Consider not just the undesirable species within your planting area but in the surrounding context.

Annual Cutbacks, Mowing or Burning

Our Landscape Plug installations, like much other herbaceous vegetation, performs best if cut back annually. This is generally recommended in the later winter or early spring. However, it is ultimately dependent on your management goals, be they based on aesthetics, biodiversity or anything else. For larger installations, mowing or burning are other beneficial management options.

Supplemental Irrigation In Severe Drought

If signs of drought stress are observed, irrigate Landscape Plugs. Over time irrigation should become less necessary.

Fertilizing and Amending Soils

Sites with stable soils and appropriately chosen species should not require additional fertilizer or amendments. When performing annual cutbacks determine if it is appropriate to remove cuttings or leave in place according to soil fertility goals.



Shipping and Delivery

- Avoid shipments during very hot or cold temperatures.
- Consult with us to determine the most plant friendly shipping method for your needs.
- Landscape Plugs are guaranteed to be protected from environmental conditions upon delivery. Check for any damage to plants immediately upon their arrival.
- Irrigate Landscape Plugs as necessary.
- Lay out and install Landscape Plugs as soon as possible upon arrival to site.
- If Landscape Plugs must be held due to construction delays, move them to a shaded staging area, irrigate as needed and protect from damage.

Custom Grow Options

- Having us custom grow your landscape plugs for a specific project and installation time can be a great option for ensuring availability and planting success.
- If there are herbaceous plants that you have specified for a site and they are not on our current availability, we may be able to custom grow them for you.
- Most Landscape Plugs require at least 16 weeks of lead time. This may vary depending on propagation method, time of year, seed availability or species requirements of certain sophisticated species.

Species Selection and other Professional Assistance

Consultation services are available. We are happy to assist you in selecting species for your design or in developing a plant palette for a challenging site. We draw knowledge from our past experiences with Landscape Plug installations and the information we collect from our three-acre trial gardens here at the nursery. We are happy to assist you with any other questions you may have. Contact us!

North Creek Nurseries, Inc.
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Landenberg, PA 19350
www.landscapeplugs.com
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1-877-ECO-PLUG

Perennials

Agastache foeniculum
Allium cernuum
Amsonia hubrichtii
Amsonia tabernaemontana var. *salicifolia*
Asclepias incarnata
Asclepias syriaca
Asclepias tuberosa
Asclepias verticillata
Aster cordifolius (syn. *Symphotrichum cordifolium*)
Aster divaricatus (syn. *Eurybia divaricata*)
Aster laevis 'Bluebird' (syn. *Symphotrichum laeve*)
Aster novae-angliae
 (syn. *Symphotrichum novae-angliae*)
Aster novae-angliae 'Purple Dome'
 (syn. *Symphotrichum novae-angliae*)
Aster novi-belgii
 (syn. *Symphotrichum novi-belgii*)
Aster oblongifolius 'October Skies'
 (syn. *Symphotrichum oblongifolium*)
Aster oblongifolius 'Raydon's Favorite'
 (syn. *Symphotrichum oblongifolium*)
Baptisia australis
Baptisia 'Carolina Moonlight'
Baptisia 'Purple Smoke'
Baptisia sphaerocarpa 'Screaming Yellow'
Callirhoe involucrata
Caltha palustris
Chelone glabra
Chelone lyonii 'Hot Lips'
Coreopsis 'Gilded Lace'
Coreopsis palustris 'Summer Sunshine'
Coreopsis verticillata
Echinacea paradoxa
Echinacea purpurea 'Ruby Star'
Echinacea purpurea
Eryngium yuccifolium
Eupatorium coelestinum
Eupatorium fistulosum
Eupatorium hyssopifolium
Eupatorium perfoliatum
Helenium autumnale
Heliopsis helianthoides
Hibiscus moscheutos
Iris versicolor
Liatis spicata
Lobelia cardinalis
Lobelia siphilitica
Lupinus perennis
Mimulus ringens
Monarda bradburiana

Monarda didyma 'Jacob Cline'
Monarda fistulosa 'Claire Grace'
Monarda fistulosa
Monarda punctata
Monarda 'Raspberry Wine'
Oenothera fruticosa 'Fireworks'
Oenothera fruticosa
Packera aurea (syn. *Senecio aureus*)
Penstemon digitalis
Penstemon digitalis 'Husker Red'
Phlox paniculata 'Jeana'
Phlox paniculata 'Robert Poore'
Physostegia virginiana 'Miss Manners' PP12637
Physostegia virginiana 'Pink Manners' PP23482
Pycnanthemum flexuosum
Pycnanthemum muticum
Pycnanthemum tenuifolium
Ratibida columnifera 'Red Midget'
Ratibida pinnata
Rudbeckia fulgida 'Goldsturm'
Rudbeckia fulgida var. *fulgida*
Rudbeckia fulgida var. *deamii* NEW
Rudbeckia laciniata
Rudbeckia triloba
Ruellia humilis
Scutellaria incana
Solidago caesia
Solidago graminifolia
 (syn. *Euthamia graminifolia* var. *graminifolia*)
Solidago odora
Solidago rugosa 'Fireworks'
Solidago sempervirens
Solidago 'Solar Cascade'
Thermopsis caroliniana
Tradescantia ohiensis
Verbena hastata
Vernonia lettermannii 'Iron Butterfly'
Vernonia noveboracensis
Veronicastrum virginicum
Zizia aurea

Grasses + Sedges

Acorus americanus
Andropogon gerardii 'Blackhawks' PPAF NEW
Andropogon gerardii
Andropogon virginicus
Bouteloua curtipendula
Bouteloua gracilis 'Blonde Ambition' PP22048
Calamagrostis × *Karl Foerster*
Calamagrostis brachytricha

Appendix A

LP50 Species List

Carex comosa
Carex emoryi
Carex lurida
Carex muskingumensis
Carex stricta
Carex vulpinoidea
Chasmanthium latifolium
Deschampsia cespitosa
Deschampsia flexuosa
Elymus virginicus
Eragrostis spectabilis
Juncus effusus
Juncus tenuis
Panicum 'Cape Breeze' PP24895
Panicum 'Northwind'
Panicum virgatum 'Shenandoah'
Panicum virgatum
Schizachyrium scoparium 'Standing Ovation' PP25202
Schizachyrium scoparium
Scirpus cyperinus
Scirpus validus
Sorghastrum nutans
Sporobolus heterolepis

Perennials

Alchemilla mollis 'Auslese'
Amsonia 'Blue Ice'
Antennaria plantaginifolia
Aquilegia canadensis
Asarum canadense
Aster ericoides 'Snow Flurry'
Aster laevis 'Bluebird'
Aster tataricus 'Jindai'
Chrysogonum virginianum var. *australe*
Coreopsis grandiflora 'SunKiss' PVP AF **NEW**
Coreopsis tripteris 'Gold Standard' **NEW**
Dicentra eximia
Echinacea 'Cheyenne Spirit'
Echinacea purpurea 'Mellow Yellows' **NEW**
Echinacea purpurea PowWow® 'Wild Berry'
Echinacea purpurea 'Green Twister' **NEW**
Erigeron pulchellus var. *pul.* 'Lynnhaven Carpet'
Eupatorium maculatum 'Gateway'
Eupatorium dubium 'Little Joe' PP16122
Eupatorium 'Phantom' PP18354
Geranium maculatum 'Espresso'
Geranium maculatum
Geum fragarioides
 (syn. *Waldsteinia fragarioides*)
Helianthus 'Lemon Queen'
Heliopsis hel. var. *scabra* 'Burning Hearts' **NEW**
Helleborus Brandywine™
Helleborus foetidus
Heuchera americana 'Dale's Strain'
Heuchera × *villosa* 'Autumn Bride'
Heuchera longiflora
Heuchera villosa 'Bronze Wave'
Heuchera × 'Frosted Violet' PP15085
Heuchera × 'Plum Pudding'
Kalimeris incisa 'Blue Star'
Lysimachia lanceolata var. *purpurea* **NEW**
Meehania cordata
Mertensia virginica
Pachysandra procumbens
Packera obovata
Phlox divaricata 'Blue Moon'
Phlox stolonifera 'Sherwood Purple'
Polemonium reptans
Porteranthus 'Pink Profusion'
 (*Gillenia trifoliata*)
Porteranthus trifoliatus
 (*Gillenia trifoliata*)
Rubus calycinoides
Rudbeckia laciniata 'Autumn Sun'
Rudbeckia maxima

Rudbeckia subtomentosa 'Henry Eilers'
Rudbeckia subtomentosa 'Little Henry' PP23590
Salvia lyrata 'Purple Knockout'
Sedum ternatum 'Larinem Park'
Solidago sphacelata 'Golden Fleece'
Spigelia marilandica
Tiarella cordifolia
Tiarella cordifolia 'Brandywine'
Tiarella cordifolia 'Oakleaf'
Tiarella cordifolia 'Running Tapestry'

Sedges + Grasses

Carex amphibola
Carex appalachica
Carex cherokeensis
Carex dolichostachya Gold Fountains™ 'Kaga-nishiki'
Carex eburnea
Carex flacca 'Blue Zinger'
Carex flaccosperma
Carex laxiculmus Bunny Blue® 'Hobb'
Carex morrowii 'Ice Dance'
Carex oshimensis 'Evergold'
Carex pennsylvanica
Carex plantaginea
Carex platyphylla
Carex radiata
Carex 'Silver Sceptre'
Deschampsia cespitosa 'Goldtau'
Hakonechloa macra
Hakonechloa macra 'Albovariegata'

Ferns

Adiantum pedatum
Athyrium 'Godzilla' **NEW**
Athyrium × 'Ghost'
Athyrium angustum f. *rubellum* 'Lady in Red'
Athyrium filix-femina
Athyrium filix-femina 'Victoriae'
Athyrium niponicum 'Pictum'
Athyrium niponicum 'Regal Red'
Athyrium otophorum **NEW**
Dryopteris erythrosora 'Brilliance'
Dryopteris goldiana
Dryopteris marginalis
Dryopteris × *australis*
Matteuccia struthiopteris
Osmunda claytoniana
Osmunda regalis var. *spectabilis*

Appendix B

Phegopteris decursive-pinnata

(syn. *Thelypteris decursive-pinnata*)

Polystichum acrostichoides

Polystichum polyblepharum

Woodies

Caryopteris × *clandonensis* Blue Empire™ PPAF

Caryopteris × 'Dark Knight'

Hydrangea arborescens 'Haas Halo' PP24783 **NEW**