HABITAT FRIENDLY

LANDSCAPE MAINTENANCE GUIDELINES

A guide to using Habitat Friendly landscape maintenance practices to help preserve ecosystems and create habitat for native insect pollinators, birds, and other wildlife in urban and suburban environments.

BUTTERFLY PAVILION

BOULDER COUNTY
COLORADO STATE UNIVERSITY EXTENSION

CELEBRATING 20 YEARS OF RESTORING NATURE
HIGH PLAINS ENVIRONMENTAL CENTER

HABITAT FRIENDLY

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A Bit About the Authors

This project is a collaboration between three organizations engaged in environmental and horticultural education: Colorado State University Extension (Deryn Davidson), High Plains Environmental Center (Jim Tolstrup), and Butterfly Pavilion (Amy Yarger). In addition, Josh Orth of Norris Design brings the perspective of a landscape architect designing landscapes with habitat function. It is our hope that this project will help to align landscape management practices more closely with habitat restoration goals within the built environment and help to preserve Colorado's unique natural beauty and biodiversity.

Overview

Between 1900 and the present, the population of the United States increased by more than 4 times (76.2 million to 327.2 million). Over the same period, Americans moved, in huge numbers, from rural settings to suburbs and cities. As a result, urban and suburban landscapes have expanded exponentially and cover significant portions of the land. In Bringing Nature Home, a groundbreaking book focused on the impacts to wildlife due to habitats being replaced by landscaping, author Douglas Tallamy presents the following statistics:

- 98% of the lower 48 states has been altered for human use.
- 65,000 square miles in the U.S. are covered by pavement.
- Turf grass covers more than 40 million acres.
- More herbicide and pesticide are used on turfgrass (per square foot) than any other crop.
- 800 million gallons of gas are used to mow American lawns every year.

Here in Colorado, a region that typically gets 12 - 14 inches of precipitation per year, the average person uses 150 gallons of water per day. 60% of residential water consumption goes to support landscaping. This amounts to approximately 90 gallons of water per person per day to keep exotic landscapes on life support. Although our growing population and a changing climate will reduce available water, thus far, we have made virtually no effort to conserve water in landscaping.

The rising cost of water is causing developers and landscape designers to diverge from the traditional exotic landscaping model and transition to "regionally appropriate landscapes.". These new landscapes often utilize native plants that are adapted to our high altitude, bright sun and dry climate, and often have interdependent relationships with our native pollinators.

Over the past few decades there has been an increasing general awareness of environmental sustainability. Many industries and individual companies have highlighted their "green initiatives" in order to demonstrate their "social responsibility" by pursuing certifications like LEED (Leadership in Energy and Environmental Design) from independent, sustainability-focused organizations. The LEED program was created by the U.S. Green Building Council in 1998 as a benchmark for green building, but the first versions lacked criteria for building sites and landscaping. In 2009, a program called the Sustainable Sites Initiative (or SITES) was created to be the landscape equivalent of LEED. SITES was developed through the collaborative, interdisciplinary effort of the American Society of Landscape Architects, The Lady Bird Johnson Wildflower Center at The University of Texas at Austin, and the United States Botanic Garden and, similarly to LEED, uses a points-based program to evaluate landscape designs for their

criteria for building sites and landscaping. In 2009, a program called the Sustainable Sites Initiative (or SITES) was created to be the landscape equivalent of LEED. SITES was developed through the collaborative, interdisciplinary effort of the American Society of Landscape Architects, The Lady Bird Johnson Wildflower Center at The University of Texas at Austin, and the United States Botanic Garden and, similarly to LEED, uses a points-based program to evaluate landscape designs for their contribution to environmental health.

In addition to the pressures of suburban sprawl and sterile landscapes, the Audubon Society reports that, on our current trajectory for climate change, 389 species of birds in North America are threatened with extinction. Many common bird species, such as the robin and broad-tailed hummingbird, while not immediately threatened by extinction, will experience loss of over 70% of their habitable range. According to the Audubon Society, bird populations in Colorado have already declined by as much as 60% over the last 40 years.

Properly managed native landscapes can provide forage and cover for birds and other wildlife. In addition, 95% of terrestrial bird species are dependent on insects in their diet, particularly during the breeding season. Plants capture the sun's energy and insects which feed directly on plants make that energy available in the form of protein for birds.

Creating and managing landscapes for aesthetic purposes alone is no longer an option if we are to conserve our native insects and the bird populations that are directly dependent on them. We must create and manage landscapes for their habitat potential, as well as for their aesthetic value. Indiscriminately destroying insects, or interrupting their life cycles, is counter to the goals of habitat friendly landscaping maintenance practices.

The good news is that we have the potential of reversing the trends of habitat loss and species decline through careful management and consideration of the needs of wildlife. And since many species have relatively short life cycles, recovery can be observed within a few seasons.

In response to the crisis of toxic and sterile landscapes, many landscape architects and designers have turned toward landscapes that provide benefits for birds, insects, and other wildlife. There is a growing ethic that landscapes need to be more than just pretty, they must help to replace some of the ecological functions of the natural areas that they have displaced.

Unfortunately, conventional landscape management often undermines the goal of habitat friendly landscape design through excessive mowing and pruning, indiscriminate pesticide use, and other harmful practices.

G = General
HS = Habitat Specific

Spec Type	Practice: Fertilizers	Landscape Architect	Contractor	HOA	Other	MasterFormat Section
G	Feed the soil with high-quality organic matter (compost, worm castings, etc, not peat), not the plant		x	x	x	32 91 13 Soil Preparation
G	If feeding the soil inadequate, apply organic fertilizers, with following conditions		x	x	x	32 91 13 Soil Preparation
G	If feeding the soil inadequate, question the appropriateness of the plant material		x	x	x	32 91 13 Soil Preparation
G	If organic fertilizers inadequate, apply chemical fertilizers, with following conditions:		x	x	x	32 91 13 Soil Preparation
G	Perform a soil analysis and fertilize according to results and plant type.		x	x	x	32 91 13 Soil Preparation
G	Apply at appropriate times (during low people use, weather conditions - wind, rain)		x	x	x	32 91 13 Soil Preparation
G	Apply appropriate amounts (be especially aware near water systems)		x	x	x	32 91 13 Soil Preparation
G	Use specific products for specific circumstance or problem (no weed and feed products)		x	x	x	32 91 13 Soil Preparation

Spec Type	Practice: Pruning	Landscape Architect	Contractor	HOA	Other	MasterFormat Section
	Prune appropriately for plant (keeping character of landscape in mind) considering bloom time, health and need for rejuvenation. Become familiar with each plant's life cycle. Managing landscapes with more diversity may require additional staff training.					
G	Use the correct tool for the task and use well maintained tools; follow defined best practices and manufacturer's directions for tool use				x	32 01 90.23 Pruning
G	Include regular time for tool cleaning and maintenance in the work schedule				x	32 01 90.23 Pruning
HS	Regular deadheading encourages a longer bloom season for many flowering plants					32 01 90.23 Pruning
G	Sanitize tools when working with diseased plants in order to prevent further infection				x	32 01 90.23 Pruning
G	Prune at right time (e.g. prune maples in late winter, before sap starts to flow)				x	32 01 90.23 Pruning
G	Check structure of trees annually and prune as needed				x	32 01 90.23 Pruning
HS	Do not cut perennials back in the fall unless for safety or sanitation; leave seeds and leaves for winter interest/habitat and to protect crowns		x			32 01 90.23 Pruning
HS	If you must cut perennials back early, cut to 1' or higher to provide stems for nesting and overwintering bees					
HS	Consider a stepwise spring cleanup, waiting for new growth to appear, and leaving some stems throughout the spring and summer during nesting season		x			32 01 90.23 Pruning
HS	Leave some debris for overwintering pollinator pupa and other beneficials		x			32 01 90.23 Pruning
G	If debris must be removed, compost or re-use except for diseased and/infested materials		x			32 01 90.23 Pruning
G	If possible, re-use debris on site (e.g. chip healthy tree branches and use for mulch)		x			32 01 90.23 Pruning
G	Allow plants to have their natural form (no green meatballs)		x			32 01 90.23 Pruning
G	Consider regenerative pruning in dormant season to reduce plant size vs excessive shearing					32 01 90.23 Pruning
HS	Avoid pruning tall shrubs during bird nesting season					32 01 90.23 Pruning
HS	Avoid pruning while plants are fruiting and flowering					32 01 90.23 Pruning
G	Ensure that all parties involved in pruning know whether plants bloom on old wood (previous year's growth) or new wood in order to avoid loss of bloom and forage					32 01 90.23 Pruning

Spec Type		Practice: Pest Management	Landscape Architect	Contractor	HOA	Other	MasterFormat Section
	Plant Health Care	*Plant Health Care approach (prevention) is the best bet for effective pest management. Understanding and monitoring the needs of the plant and the conditions of the site allow for long-term thriving landscapes. This approach also mitigates any potential harm to beneficial wildlife and their habitats from pest controls. However, when controls are needed, practitioners should consider an Integrated Pollinator and Pest Management (IPPM) strategy, which factors habitat health into every step of the process.*					
G		Build soil for plant health - (See Soils and Groundcovers tab). Depending on the nature/ function of the landscape, you may or may not have as much control over the soil quality. It is important to understand the soil requirements of plant species from design through maintenance (ex. many natives prefer native soils, but some can thrive in rich, amended soil).	x	x	x	x	32 01 90 Operation and Maintenance of Planting
G		Ensure the right plant is in the right place - assess environmental conditions and plant requirements (both environmental and maintenance). Group plants with similar needs together.	x			x	32 01 90 Operation and Maintenance of Planting
HS		Design landscape to coexist with local wildlife. Rabbits and caterpillars are a fact of life, and we can use the right plant material in the right amounts to keep damage below thresholds.	x		x	x	32 01 90 Operation and Maintenance of Planting
HS		Use appropriate and diverse plant material to create a healthy ecosystem that helps control insect and disease problems	x		x	x	32 01 90 Operation and Maintenance of Planting
G		Monitor plant material for signs of stress, which signify a greater chance of being infested. Address water and nutrient deficiencies or decide if plant is not suited to the site or its function in the landscape.		x	x	x	32 01 90 Operation and Maintenance of Planting
G		Monitor landscape for possible problems that may lead to pests or disease - irrigation malfunctions, lack of air circulation, surrounding conditions. Address these issues as soon as possible.					32 01 90 Operation and Maintenance of Planting
G		Prepare for action when conditions are extreme. Even if your plantings are well-selected for the site generally, unpredictable storms, droughts or other events may make them more susceptible. Some landscapes should be designed to be extra-resilient (hot urban corridors, areas with historic flooding).	x		x	x	32 01 90 Operation and Maintenance of Planting
G		Thoroughly inspect plant material before purchase to avoid contamination		x	x	x	32 01 90 Operation and Maintenance of Planting
G		Remove and avoid high-maintenance or susceptible plant species in plantings	x	x			32 01 90 Operation and Maintenance of Planting

Spec Type		Practice: Pest Management	Landscape Architect	Contractor	HOA	Other	MasterFormat Section
	Integrated Pollinator and Pest Management	*When pests do strike, follow an integrated strategy that also incorporates an understanding of wildlife habitat requirements in order to limit possible harm.*					
HS		Taking no action is an option - assess the long-term impact of the problem. Understand the regular seasonal cycle of the site. Set reasonable threshold (for the landscape function and expectation) What are your objectives for your landscape? What are you willing to live with? What state and local laws may be involved?	x	x	x	x	32 01 90 Operation and Maintenance of Planting
HS		Perform a cost/benefit analysis for each available control. Look at effectiveness, timeliness, ease of use, accessibility, cost, environmental effects, for each possible control.		x	x	x	32 01 90 Operation and Maintenance of Planting
HS		Any control may have to be adjusted in when, how, how much it is used if it is likely to cause sigificant harm to pollinator/wildlife habitat. Knowing your local wildlife and their requirements is key in making these decisions! (See last 2 tabs) (Ex. removing debris in autumn)		x	x	x	32 01 90 Operation and Maintenance of Planting
HS		Set up a monitoring program to track potential infestations and address while they are still manageable. A robust monitoring program can also reveal if pollinators are increasing or declining in response to management practices.		x	x	x	32 01 90 Operation and Maintenance of Planting
HS	**Chemical controls**	Consider natural repellents (hot pepper, garlic), but understand their limitations. Typically used for mammal pests - most mammal herbivores are "neophobic", so they will become accustomed to any flavor or scent if exposed to it long enough. They also may have negative impacts on the wildlife you want. Repellents may also wash off in the rain and may need to be re-applied often...or they may have odors that offend nearby humans. If you are going to use them, use strategically and set up a "rotation", so that herbivores do not become accustomed.		x	x	x	32 01 90 Operation and Maintenance of Planting
HS		Consider organic and natural pesticides ("soft controls" - insecticidal soap, vinegar, horticultural oil, diotemaceaous earth), but understand that "organic" doesn't necessarily mean it is safe for wildlife. Examine what potential impacts these controls have on non-pest wildlife and adjust timing and scale as needed (ex. butterfly caterpillars need to eat leaves, too).		x	x	x	32 01 90 Operation and Maintenance of Planting
HS		Whenever possible, eliminate or minimize use of non-organic/chemical pesticides, especially systemics. When these are necessary, apply when the substance is likely to have the least negative effect on other wildlife (i.e. avoid bloom or nesting season). Prevent runoff from contaminating waterways.		x	x	x	32 01 90 Operation and Maintenance of Planting
G		Use best practices and follow all directions before using any chemical control. Stay up to date with licensing and new research on environmental impacts.		x	x	x	32 01 90 Operation and Maintenance of Planting

HS	**Physical controls**	Well-timed, temporary physical barriers or actions may protect plants from pests during a vulnerable time		x	x	x	32 01 90 Operation and Maintenance of Planting
HS		For certain pests (i.e. beetles) and situations, traps or regular collecting may reduce damage. However, traps can also attract additional pests if you are surrounded by a large population.		x	x	x	32 01 90 Operation and Maintenance of Planting
HS		Barriers, row covers and cages are usually a temporary and/or small-scale solution. They can be useful for pests that have a seasonal "flare", like grasshoppers or baby bunnies or for high value plant speciments.		x		x	32 01 90 Operation and Maintenance of Planting
G		Fencing to prevent mammal access has to be tough, thorough (do you need to sink the fence underground? Is it tall enough?), checked often for breaches. Set up a schedule to monitor the perimeter.	x		x		32 01 90 Operation and Maintenance of Planting
HS	**Biological controls**	Introduce beneficial insects or lure them in. Design habitat and include plants that attract and retain beneficial insect predators, such as green lacewings, ladybugs and ichneumonid wasps	x	x	x	x	32 01 90 Operation and Maintenance of Planting
HS		Before releasing biocontrols, ensure that you have created the right conditions for the bugs to do their jobs over their entire life cycle. Adjust moisture/ light levels, know if there are any potential predators (ex. ants) and release them at the right time of day.		x	x	x	32 01 90 Operation and Maintenance of Planting
HS		Bt and other bacterial agents also count as biological controls - these are species specific. Again, adjust the environmental conditions so that these agents can succeed and follow directions from your supplier.		x		x	32 01 90 Operation and Maintenance of Planting
HS		Develop a business relationship with your biocontrol supplier so that they can make recommendations specific to your needs and conditions. The best suppliers have entomologists and horticulturists who have extensive experience with all sorts of pest management issues.		x		x	32 01 90 Operation and Maintenance of Planting
HS		Sometimes predators will prey on other beneficials (i.e. pollinators). However, if you have a diverse, robust landscape, this doesn't cause concern. If you are releasing biocontrols, make sure you are choosing the right organism for the problem and using the right application rate.		x	x	x	32 01 90 Operation and Maintenance of Planting
HS		After application, track populations and plant health to measure efficacy					32 01 90 Operation and Maintenance of Planting
HS	**Cultural controls**	Adapting the environment to make it less supportive of pests requires understanding of pest life histories and requirements (ex. poor air circulation and powdery mildew, changing overwintering conditions, reducing fertilization).	x	x	x	x	32 01 90 Operation and Maintenance of Planting
HS		Identify the "weak link" in the pest-plant interaction in order to adjust the plant's cultivation for the biggest impact - what is the factor that promotes pest infestation? Check moisture, nutrient and temperature levels.		x	x	x	32 01 90 Operation and Maintenance of Planting
HS		Time crops/ plantings to avoid seasonal pest outbreaks		x	x	x	32 01 90 Operation and Maintenance of Planting

Spec Type		Practice: Weed Management	Landscape Architect	Contractor	HOA	Other	MasterFormat Section
	Weed Prevention/ Mitigation	*Tailor weed control practices for conditions of site*					
G		Design landscape with optimum plant health care (to support the right amount of competition) and weed invasion potential of various areas in mind					32 01 90 Operation and Maintenance of Planting
HS		Space plant stock to balance weed competition and "live mulching" with competition with surrounding desirable plants					32 01 90 Operation and Maintenance of Planting
G		Use least toxic strategies for weed control					32 01 90 Operation and Maintenance of Planting
HS		In areas where ground-nesting bees already have sufficient bare ground, managed plantings should use thick mulches (3-4" settled organic mulch or gravel). Allow some areas with bare soil or low mulch which are necessary for nesting bees.					32 01 90 Operation and Maintenance of Planting
HS		Limit disturbance of soil in managed plantings					32 01 90 Operation and Maintenance of Planting
HS		Time or scale weed management practices as much as possible to minimize interference of wildlife life cycles					32 01 90 Operation and Maintenance of Planting
G		Evaluate effectiveness of weed management plan and adapt according to results					32 01 90 Operation and Maintenance of Planting
G		Consider use of cover crops to outcompete weeds and exhaust soil seed bank (and improve soil)					32 92 19 Seeding
G		Consider using sheet mulch to smother weeds					32 91 13 Soil Preparation
G		Over-watering and excessive nutrients are among the greatest contributors to weed growth					32 01 80 Operation and Maintenance of Irrigation

Spec Type		Practice: Weed Management	Landscape Architect	Contractor	HOA	Other	MasterFormat Section
	Weed Control	*Implement IPPM with a goal to limit use of herbicides. Consider physical, cultural or biological methods such as hand weeding, mowing/grazing.*					
HS		If a weed provides key resources for wildlife (i.e. nectar/pollen in a barren area), create a plan to replace that resource as soon as possible					32 01 90 Operation and Maintenance of Planting
G		For heavily infested sites, create a weed management plan that includes prioritization of weed controls for different species					32 01 90 Operation and Maintenance of Planting
G		Apply herbicides only at appropriate times (during low people use, weather conditions - wind)					32 01 90 Operation and Maintenance of Planting
G		Choose herbicides with minimal toxicity and persistence for active and inert ingredients; especially examine labels for impact on aquatic ecosystems					32 01 90 Operation and Maintenance of Planting
G		Limit unnecessary disturbance which can encourage the germination of more weeds					32 91 13 Soil Preparation
G		Manage "colonization" or spreading of "desirable" species in order to maintain legibility of design in planted beds					32 01 90 Operation and Maintenance of Planting
G		Apply pre-emergent prior to season (to minimize need for herbicide)					32 91 13 Soil Preparation
G		Most annual weeds can be managed by mowing, cutting or pulling to prevent seed production					32 01 90 Operation and Maintenance of Planting

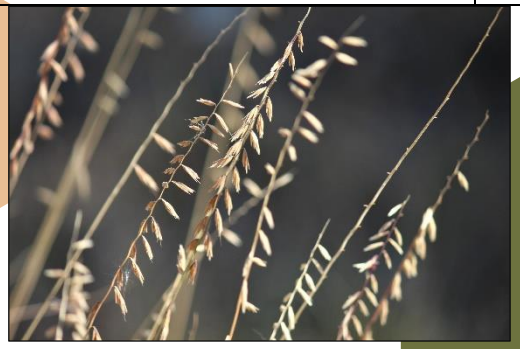
Spec Type		Practice: Weed Management	Landscape Architect	Contractor	HOA	Other	MasterFormat Section
	Weed Management Strategies						
G		It is absolutely critical that all applicators be as familiar with weed species as desirable plants					32 01 90 Operation and Maintenance of Planting
G		Annuals (germinate and die within one growing season)					32 01 90 Operation and Maintenance of Planting
G		Control by minimizing or preventing seed by mowing or spraying					32 01 90 Operation and Maintenance of Planting
G		Perennials (can live for many years and spread by underground roots)					32 01 90 Operation and Maintenance of Planting
G		Controlling seed production can help (mowing). In order to eradicate, roots need to be destroyed.					32 01 90 Operation and Maintenance of Planting
G		Pulling may work in the case of more shallow rooted plants (knapweed, catmint, bull thistle)					32 01 90 Operation and Maintenance of Planting
G		Pulling and mowing may require multiple seasons to show results.					32 01 90 Operation and Maintenance of Planting
		Plants with deep or extensive root systems may require spraying (Canada thistle, bindweed)					32 01 90 Operation and Maintenance of Planting

Spec Type		Practice: Disease Management	Landscape Architect	Contractor	HOA	Other	MasterFormat Section
	Prevention	*With disease especially, prevention is much easier than treatment, especially since environmental factors can play a significant role in promoting disease. Understanding and monitoring the needs of the plant and the conditions of the site allow for long-term thriving landscapes. This approach also mitigates any potential harm to beneficial wildlife and their habitats from disease controls.However, when controls are needed, practitioners should consider an Integrated Pollinator and Pest Management (IPPM) strategy, which factors habitat health into every step of the process.*					
G		Design with diversity in mind. Monocultures are more likely to show the negative impacts of disease and/or allow disease vectors to infect more efficiently.	x				32 01 90 Operation and Maintenance of Planting
G		Replace problem plants with better adapted varieties - look for resistant varieties when possible	x	x	x	x	32 01 90 Operation and Maintenance of Planting
G		Designate plant spacing for long-term health, reducing competition and improved air circulation	x	x		x	32 01 90 Operation and Maintenance of Planting
G		Observe surrounding conditions. Do you see evidence of disease nearby?		x	x	x	32 01 90 Operation and Maintenance of Planting
G		Time plantings to avoid infection. Be aware of seasonal outbreaks as well as environmental conditions that make disease more likely.		x		x	32 01 90 Operation and Maintenance of Planting
G		Inspect plant material before purchase for signs of disease - exclude diseased plants from area	x	x		x	32 01 90 Operation and Maintenance of Planting
G		Handle plants gently - injury can lead to infection		x		x	32 01 90 Operation and Maintenance of Planting
G		Practice good plant health care - proper siting, manage nutrients, light and moisture, smart pruning practices		x	x	x	32 01 90 Operation and Maintenance of Planting
G		Remove alternate hosts from landscape (i.e. rusts)		x	x	x	32 01 90 Operation and Maintenance of Planting
G		Manage disturbance in your landscape - large shocks to the system can weaken defenses	x	x	x	x	32 01 90 Operation and Maintenance of Planting
	Identification	*Know what you are fighting so that you can apply the appropriate control and you can predict the spread of the disease.*					
G		Diseases are often specific to a group of hosts - plant id will narrow diagnosis down		x		x	32 01 90 Operation and Maintenance of Planting
G		Use extension agents and local experts to help if needed - symptoms can be difficult to identify		x		x	32 01 90 Operation and Maintenance of Planting
G		Monitor plantings for signs of disease and address problems in early stages		x	x	x	32 01 90 Operation and Maintenance of Planting

Spec Type		Practice: Disease Management	Landscape Architect	Contractor	HOA	Other	MasterFormat Section
	Threshold	*It is rarely possible to prevent or eradicate disease entirely from the landscape, but health can be maintained at an acceptable level through an integrated approach.*					
G		Do nothing - is it really a problem? Assess impact on long-term health and aesthetics of plantings.		x	x	x	32 01 90 Operation and Maintenance of Planting
	Disease Controls	*Evaluate at all the tools in your toolbox - physical, cultural, chemical and biological*					
HS		Consider combining controls - "silver buckshot" vs. "silver bullet" approach may be necessary		x	x	x	32 01 90 Operation and Maintenance of Planting
HS		Use Integrated Pollinator and Pest Management (IPPM) approach - consider possible side effects of controls on wildlife and habitats		x	x	x	32 01 90 Operation and Maintenance of Planting
HS		Use least toxic chemical controls available		x	x		32 01 90 Operation and Maintenance of Planting
HS		Soil disinfection is a drastic control, since it impacts all soil fauna - drenching, fumigation, solarization		x	x	x	32 01 90 Operation and Maintenance of Planting
HS		Exclude vectors (i.e. leafhoppers with aster yellows) - row covers or other barriers		x		x	32 01 90 Operation and Maintenance of Planting
G		Rotate plantings if disease has exceeded thresholds		x		x	32 01 90 Operation and Maintenance of Planting
	Sanitation	*Good sanitation can reduce the spread and impact of disease in the landscape.*					
G		Make time for necessary sanitation each day	x	x	x	x	32 01 90 Operation and Maintenance of Planting
G		Dispose of infected plants to reduce spreading pathogen - may need to bag and landfill instead of compost		x		x	32 01 90 Operation and Maintenance of Planting
G		Disinfect tools, carts, footwear - whatever might have come into contact with diseased plant material		x		x	32 01 90 Operation and Maintenance of Planting
G		Fall garden cleanup should be limited to diseased or dead material, as well as anything that poses a safety risk		x	x	x	32 01 90 Operation and Maintenance of Planting

Spec Type	Practice: Turf Management	Landscape Architect	Contractor	HOA	Other	MasterFormat Section
G	Follow seasonal practices for healthy turf - topdressing, aeration, dethatching, rerolling, etc		x	x	x	32 01 90 Operation and Maintenance of Planting
G	Mow to appropriate height to allow turf to compete with weeds and feed itself, in cross patterns, leave clippings on		x	x	x	32 01 90 Operation and Maintenance of Planting
G	Use on-site resources for fertility, such as grass clippings left on turf		x	x	x	32 01 90 Operation and Maintenance of Planting
G	Implement low intensity mowing practices - Decrease mowing intervals to least needed for health of turf		x	x	x	32 01 90 Operation and Maintenance of Planting
HS	Delay preventative insecticide applications until May or June and avoid applying insecticides in the middle of the day when pollinators are usually most active.		x	x	x	32 01 90 Operation and Maintenance of Planting
HS	Implement an integrated pollinator and pest management (IPPM) system for turf grass management		x	x	x	32 01 90 Operation and Maintenance of Planting
HS	Consider installing and maintaining "bee lawns". This is a concept unproven in Colorado, but gaining popularity in other parts of the country.	x			x	32 01 90 Operation and Maintenance of Planting
G	Plant turf where it will be useful, not as a default - turf offers little habitat value	x				32 01 90 Operation and Maintenance of Planting

Spec Type		Practice: Native Grass Management	Landscape Architect	Contractor	HOA	Other	MasterFormat Section
	Design and Implementation						
G	**Seed type**	Select or design a mix that includes species appropriate for the site including; climate, hydrology, slope, aspect, etc. Consider both cool and warm season grasses	X	X			32 01 90 Operation and Maintenance of Planting
HS		Note: Smooth Brome *(Bromus inermis)* and Crested Wheatgrass *(Agropyron cristatum)* commonly found in "dry land" seed mixes are aggressive non-natives that should generally be avoided.	x				32 01 90 Operation and Maintenance of Planting
G	**Soil amendments**	Soil tests are recommended. Howeve,r amendments are not usually necessary and high nutrients may be detrimental. Breaking up compacted soil is extremely important	X	X			32 01 90 Operation and Maintenance of Planting
G	**Cover crops**	Cover crops can act as a nurse crop providing shelter for grass seedlings, soil stabilization and weed suppression. Can make a positive impression on clients.	X	X			32 01 90 Operation and Maintenance of Planting
G	**Crimping with straw or hydro-mulch**	Crimping can help with soil stabilization particularly on slopes and help suppress weeds. Can make a positive impression on clients (looks neat) but is costly	X	X			32 01 90 Operation and Maintenance of Planting
G	**Weather**	Warm or cool season grasses may become dominant depending on when the seeding is done i.e.. Cool season grasses will predominate in spring seeding.					32 01 90 Operation and Maintenance of Planting
G		Natural precipitation is unpredictable (see irrigation)					32 01 90 Operation and Maintenance of Planting
G	**Irrigation**	Irrigation is extremely helpful in getting seed to germinate and establish and can move project years ahead of un-irrigated sites. Excessive irrigation after year one can accelerate weed growth	X	X			32 01 90 Operation and Maintenance of Planting



Spec Type		Practice: Native Grass Management	Landscape Architect	Contractor	HOA	Other	MasterFormat Section
	Adaptive Management Strategies						
G		Results of native grass seeding are highly variable and unpredictable, an adaptive management plan involving an experienced ecologist or horticulturist is essential. Taylor responsive management to evolving conditions and establish reasonable expectations and timelines with all parties	X	X			32 01 90 Operation and Maintenance of Planting
G		Native grass should typically be mowed in year 1 as often as necessary to prevent annual weeds from producing seed. Note: it is helpful to wait as long as possibly, letting the weeds get tall and close to seeding (in flower) before mowing, in order to weaken the plants.		X	X		32 01 90 Operation and Maintenance of Planting
G		After year 1 native grass should generally not be mowed at all with the exception of spot mowing weeds. Mowing should be avoided in established native areas as mowing typically stresses grass and increases weed growth.		X	X		32 01 90 Operation and Maintenance of Planting
G		Native "Turf" areas may be mowed once at the beginning of the growing season. Additional mowing is unnecessary and potentially harmful to the grass.		x	x		32 01 90 Operation and Maintenance of Planting
G		Trail edges (beauty bands) and fence lines of adjacent properties may be mowed twice per month in April and May and monthly there after.		x	x		32 01 90 Operation and Maintenance of Planting
G		Note: it is helpful to seed beauty band areas with low grows that can tolerate mowing.	x				32 01 90 Operation and Maintenance of Planting
HS		Mowing should particularly be avoided between March 15 and June 15 when ground nesting birds and other wildlife are most vulnerable.		X	X		32 01 90 Operation and Maintenance of Planting
G		Perennial weeds in native grass (particularly native "turf") are best managed in spring and fall. Weeds are most visible when grass is dormant.					32 01 90 Operation and Maintenance of Planting
G		Annual weeds are not usually an issue in undisturbed, established, and properly managed native grass		X			32 01 90 Operation and Maintenance of Planting
G		Native grass does not typically benefit from fertilizing and nutrients can be potentially harmful		X			32 01 90 Operation and Maintenance of Planting
HS		If wildflowers are to be included, add after grass becomes established and weeds are minimized	x			x	32 92 19 Seeding
HS		Wildflowers may be established in intensively managed "islands" and allowed to spread over time	x			x	32 92 19 Seeding

Spec Type		Practice: Irrigation Maintenance	Landscape Architect	Contractor	HOA	Other	MasterFormat Section
	Design	*Proper irrigation management is an important element of maintaining Habitat-Friendly Landscapes. There are a variety of sources outlining Best Management Practices (BMPs) for irrigation system planning, design, installation, and maintenance. All of these share a common statement to apply water efficiently, effectively, without adverse impacts to the environment being supported with supplemental watering. In Colorado, as well as many other locations, water conservation is a necessary part in strategizing how water will be applied to a landscape. A properly watered landscape will support a well-balanced, sustainable ecosystem. The checklist below is intended to highlight those items in Irrigation System planning and operations which are most valuable to building and maintaining Habitat-Friendly Landscapes. This is not a complete list of items to consider with irrigation systems. It is recommended that a certified professional, and a variety of sources are consulted with irrigation practices.*					
G		Establish water budgets prior to system design which consider sustainable site conditions and overall design intent	X				32 01 80 Operation and Maintenance of Irrigation
G		Specify products and materials which automatically adjust for weather conditions	X	X			32 01 80 Operation and Maintenance of Irrigation
G		Specify control systems which are easy to operate, report water usage, and shut off for leaks or breaks	X	X			32 01 80 Operation and Maintenance of Irrigation
G		Utilize appropriate irrigation system design based on the geometry of spaces, to avoid inefficiencies or over spray. Normally this is defined by the regulatory agency, but in general this differentiates between drip, subsurface, bubblers, and spray systems.	X	X	X		32 01 80 Operation and Maintenance of Irrigation
G		Maximize Distribution Uniformity (DU) for spray zones. This requires considering obstructions, predominant winds, and topography	X				32 01 80 Operation and Maintenance of Irrigation
	Water Budgeting						
G		Follow Best Management Practices (BMPs) for determining watering rates and establishing budgets. Refer to guidelines set forth by the Qualified Water Efficient Landscaper program (QWEL). Most sources will reference Evapotranspiration (ET) based watering programs.	X	X	X		32 01 80 Operation and Maintenance of Irrigation
G		Generally group plants by high, moderate, and low water use, then by drip or spray. These catagories should be defined based on site conditions and plant selection. Utilize the average watering needs for the ranges of these three catagories and two subcatagories.	X	X			32 01 80 Operation and Maintenance of Irrigation
G		High water use (greater than 15 gallons/s.f./year)	X	X			32 01 80 Operation and Maintenance of Irrigation
G		Moderate water use (7.5 gallons/s.f./year to 15 gallons/s.f./year)	X	X			32 01 80 Operation and Maintenance of Irrigation
G		Low water use (less than 7.5 gallons/s.f./year)	X	X			32 01 80 Operation and Maintenance of Irrigation

Spec Type		Practice: Irrigation Maintenance	Landscape Architect	Contractor	HOA	Other	MasterFormat Section
	Installation						
G		Verify static pressure at the water point of connection to ensure system will perform as designed.		X			32 01 80 Operation and Maintenance of Irrigation
HS		Inspect the site prior to doing any work or preparing material submittals to identify exisiting conditions, such as undisturbed areas, ground nests, or other habitats that could be adversely impacted by the irrigation system (installation or operation).	X	X			32 01 80 Operation and Maintenance of Irrigation
G		Provide material submittals for review and approval prior to installation.	X	X			32 01 80 Operation and Maintenance of Irrigation
G		Identify opportunties for substitutions, design changes, and cost savings prior to installing any products. This may require redesign of the system to achieve proper performance	X	X			32 01 80 Operation and Maintenance of Irrigation
G		Follow specifications and approved plans as closely as possible. If adjustments are needed, obtain approval prior to doing the work.	X	X			32 01 80 Operation and Maintenance of Irrigation
G		Conduct third party inspections		X		X	32 01 80 Operation and Maintenance of Irrigation
G		Perform pressure tests to identify if there are system leaks		X			32 01 80 Operation and Maintenance of Irrigation
G		Perform spray coverage tests		X			32 01 80 Operation and Maintenance of Irrigation
G		Install pop-up indicators on drip zones to verify operation		X			32 01 80 Operation and Maintenance of Irrigation
G		Leave drip emitters exposed so operation can be observed		X			32 01 80 Operation and Maintenance of Irrigation
G		Audit or certify the irrigation at completion to document proper performance, installation, and compliance with the agency standards and design intent.	X	X		X	32 01 80 Operation and Maintenance of Irrigation
G		Phase the installation of work to minimize the amount of disturbed area on a site at any given time. Complete one area prior to beginning the next.	X	X		X	32 01 80 Operation and Maintenance of Irrigation

Spec Type		Practice: Irrigation Maintenance	Landscape Architect	Contractor	HOA	Other	MasterFormat Section
	Operation and Maintenance						
G		Stagger initial (higher volume) watering schedules required for establishment of new plant material to decrease impacts to the infrastructure and to lessen impacts on existing habitats.		X			32 01 80 Operation and Maintenance of Irrigation
G		Utilize temporary (removable) irrigation systems to assist with low-water use landscapes that will not require a regular or sustained watering program.	X	X			32 01 80 Operation and Maintenance of Irrigation
G		Adjust irrigation schedule according to soil and weather conditions (manual adjustment, water budget timers, ET timers, soil moisture sensors)		X			32 01 80 Operation and Maintenance of Irrigation
G		Where self adjusting controllers are not used, make monthly adjustments to the irrigation programs. Usually this can be done adjusting the seasonal adjustment percentage. Consider the peak season demand to be 100% and adjust down each month based on weather patterns.		X			32 01 80 Operation and Maintenance of Irrigation
G		Educate customer on proper operation and maintenance of irrigation system including seasonal adjustments	X		X		32 01 80 Operation and Maintenance of Irrigation
HS		Spray irrigation should have a minimum of 70% Distribution Uniformity to prevent over saturation of low areas that could potentially drown ground nesting pollinators.	X	X			32 01 80 Operation and Maintenance of Irrigation
G		Subsurface and drip irrigation systems should place water on the active root zone of plants. Do not place emitters at the trunk or stem - they should be placed on the edge of the root ball and adjusted or expanded as a plant grows.	X	X			32 01 80 Operation and Maintenance of Irrigation
G		Cycle-soak irrigation programs to promote deep root watering and reduce runoff based on soil infiltration rates, slope, aspect, and capacity. Calculated and measured methods are preferable.		X			32 01 80 Operation and Maintenance of Irrigation
G		Identify sources of waste water by regularly monitoring the irrigation system. Where possible utilize a Master Valve, Flow Sensor, and Smart Controller so that the system automatically adjusts and records system performance. All commecial landscapes should have a system like this. Residential systems will normally require a weekly visual inspection to assert if the system is operating within normal parameters.		X			32 01 80 Operation and Maintenance of Irrigation
G		Reduce watering frequency as plants become established over first season and for several years.		X			32 01 80 Operation and Maintenance of Irrigation
G		Don't water (or limit watering) cool-season grasses in heat of summer (KBG & Perennial Rye will go dormant)		X			32 01 80 Operation and Maintenance of Irrigation
G		Check actual water use of established landscape against designed water budget			X		32 01 80 Operation and Maintenance of Irrigation

Spec Type		Practice: Irrigation Maintenance	Landscape Architect	Contractor	HOA	Other	MasterFormat Section
	Monitoring						
G		Audit portions of the spray irrigation system annually to verify distribution uniformity and system effciency.		X		X	32 01 80 Operation and Maintenance of Irrigation
G		Audit water bills monthly to compare against weather patterns and water budgets.			X	X	32 01 80 Operation and Maintenance of Irrigation
G		Establish a frequency for performance review of the irrigation system that is appropriate for the annual water cost. For example a residential lot may require a once annual review while a master planned community may require bi-weekly system reviews.			X		32 01 80 Operation and Maintenance of Irrigation
G		Locate damages to the irrigation system immediately. Repair in a timely manner based on how the damage could impact the overall water budger or property. Spray systems should be given a higher priority.		X			32 01 80 Operation and Maintenance of Irrigation

Spec Type		Practice: Hardscape Maintenance	Landscape Architect	Contractor	HOA	Other	MasterFormat Section
	Planning and Installation	*Installation of walks and paths, specifically concrete, asphalt, and stability treated soft surface materials should be sensitive to existing conditions. The location of these surfaces should be designed to minimize the impact to existing conditions where pollinator habitats may exist or may be emerging. When placing these paths, consider all impacts of construction techniques such as run off from cure treatments, and how areas will be accessed during construction. Soil compaction should be minimized.*					
HS		Design and layout walks and paths to minimize disruption to existing landscapes and pollinator habitats. Consider the path itself and the grading and routes used to construct the surfacing.	X	X			31 00 00 Civil Improvements
HS		Do not compact beyond the boundaries of the walk or path. This may disturb ground nests or adversely impact landscape that support pollinator habitats.		X			31 00 00 Civil Improvements
G		Avoid overspray of concrete cure on surrounding surfaces. Do not use an excessive amount that can run off and adversely impact adjacent landscapes.		X			31 00 00 Civil Improvements
	Maintenance	*Maintenance of hardscape surfaces has minimal impact on Habitat-Friendly Landscapes other than any cleaners used, which could run off into adjacent existing landscapes.*					
HS		Use biodegrable cleaners to minimize the impacts to adjacent landscapes and ground nesting pollinators		X	X		32 01 11 Paving Cleaning
HS		Avoid salt or deicers that will adversely impact the adjacent landscape and ground nesting pollinators		X	X		32 01 30.13 Snow Removal
G		Prioritize walks and trails and set thresholds which allow reduced frequency of snow removal, and related treatements which cause damage to landscapes and irrigation systems.		X	X		32 01 30.13 Snow Removal

Spec Type		Practice: Soil and Groundcovers	Landscape Architect	Contractor	HOA	Other	MasterFormat Section
	Soil Compaction	*Don't compact soil and create hard-pan*					
G		Designate site access and material storage areas	x	x		x	32 91 13 Soil Preparation
G		Avoid traffic on soil when wet	x	x	x	x	32 91 13 Soil Preparation
G		Use light weight equipment and hand labor	x	x		x	32 91 13 Soil Preparation
G		Use track vs wheeled equipment		x		x	32 91 13 Soil Preparation
	Soil Improvement	*Only improve soil where needed for plants that are not adapted to existing conditions. Use plants that are adapted to existing conditions.*					
G		Perform soil test prior to plant selection (if possible) and installation to determine need for amendments	x	x		x	32 91 13 Soil Preparation
	On Site Soil Improvement	*Improve soil using on site resources*					
G		Till in organic matter produced by site prep when available.					
G		Use removed sod to build berms		x		x	32 91 13 Soil Preparation
G		Compost organic matter from site prep when available		x		x	32 91 13 Soil Preparation
G		Sow cover crops to prevent erosion, grow out weed seeds in soil seed bank, increase soil organic matter and fix nitrogen		x		x	32 91 13 Soil Preparation
G		Lay sheet mulch (also suppresses weeds)		x		x	32 91 13 Soil Preparation
G		Chip larger organic debris from site for mulch		x		x	32 91 13 Soil Preparation

Spec Type		Practice: Soil and Groundcovers	Landscape Architect	Contractor	HOA	Other	MasterFormat Section
	Soil Amendments	*Only when the project requires it, bring in soil amendments that build soil health and support the planting plan.*					
G		As with all green materials, when sourcing soil amendments prefer local, non-toxic materials with low embodied energy	x	x		x	32 91 13 Soil Preparation
G		Use local, recycled materials (e.g. manure, brewery waste, sawdust and wood chips, yard waste, agricultural waste, sewage sludge [on non-edible plants])	x	x		x	32 91 13 Soil Preparation
G		Use compost to create topsoil. Don't import topsoil or topsoil mixes	x	x		x	32 91 13 Soil Preparation
G		Choose bulk soil amendments over bagged	x	x		x	32 91 13 Soil Preparation
G		Use organic soil amendments, not fertilizers. Organic soil amendments contain a full range of plant nutrients and add organic matter which improves the structure, water holding capacity and pollution mitigation potential of the soil, and feed soil life.	x	x		x	32 91 13 Soil Preparation
G		Loosen subsoil with deep trenching, deep forking, chisel plow		x		x	32 91 13 Soil Preparation
HS	**Soil Life**	Consider amendments that support appropriate soil fauna		x		x	32 91 13 Soil Preparation
G	**Structural Soil**	Consider using structural soil in urban or high traffic areas		x		x	32 91 13 Soil Preparation
G	**Erosion Control**	Follow stormwater management plan during grading and construction		x		x	32 91 13 Soil Preparation

Spec Type		Practice: Soil and Groundcovers	Landscape Architect	Contractor	HOA	Other	MasterFormat Section
HS	**Organic Mulch**	Use organic mulch in newly planted areas or locally-sourced gravel mulch, depending on site and type of planting		x	x	x	32 91 13 Soil Preparation
HS		If using organic mulch, it may need to be re-applied regularly depending on the planting - include in maintenance plans		x	x	x	32 91 13 Soil Preparation
G	**Local, Recycled Mulch**	Use locally-produced, recycled mulch		x	x	x	32 91 13 Soil Preparation
HS	**Avoid Plastic and Fabric**	Avoid use of black plastic and landscape fabrics in planting beds		x	x	x	32 91 13 Soil Preparation
G	**Recycle**	Where possible, recycle plant trimmings and annual leaf litter (chipped or shredded, if necessary) on site as mulch; ensure that these plant trimmings have not been treated with anything and/or are not diseased and match the use with the site/ plant community		x	x	x	32 91 13 Soil Preparation
G	**Self-Mulching**	Choose self-mulching plants (plants whose leaf litter can be left as mulch, such as pines)		x	x	x	32 91 13 Soil Preparation
HS		Allow for areas of bare soil in areas where ground-nesting bees are present		x	x	x	32 91 13 Soil Preparation
HS		The best solution is to layer plantings (understanding how they may or may not spread over time) and adjust spacing so that plants become "living mulch"		x	x	x	32 91 13 Soil Preparation

Spec Type		Practice: Equipment Maintenance	Landscape Architect	Contractor	HOA	Other	MasterFormat Section
	Equipment and Tools	*Best Management Practices associated with Grading and Erosion Control define many procedures for equipment care both on and off site that are intended to eliminate pollution to storm water system and the site's ecosystem and cross contamination between sites. This section is intended to focus on the items which affect Habitat-Friendly Landscpes. Such items include soil compaction, pollutants, and approaches that may reduce the ability to observe or micromanage sensitive systems.*					
G		Use the right size of tool for the task to minimize trips, etc		X			32 01 90 Operation and Maintenance of Planting
G		Avoid creating frequently used paths for maintenance. Spread access across larger areas to minimize disruption to emerging systems and soil compaction.		X			32 01 90 Operation and Maintenance of Planting
G		Purchase multi function tools - mulching mower, dingo with multiple attachments		X			32 01 90 Operation and Maintenance of Planting
G		Do by hand where appropriate scale (rake vs. blower)		X	X		32 01 90 Operation and Maintenance of Planting
G		Utilize equipment that is appropriate for the scale of the task, in a way that prevents damage and reduces time input. For instance do not over size mowers to get done quicker if this will scalp the ground in places or create ruts that will lead to soil erosion.		X	X		32 01 90 Operation and Maintenance of Planting
HS		Avoid using two stroke motors to reduce noise and emissions		X			32 01 90 Operation and Maintenance of Planting
G		Maintain all equipment off site and keep in good working order. Focus on ensuring all gasoline motors are properly jetted to reduce contaminants.		X			32 01 90 Operation and Maintenance of Planting
G		Service all equipment regularly basis based on frequency of use. Sharpen blades, change oil, etc.		X			32 01 90 Operation and Maintenance of Planting
G		Ensure all staff is properly trained on how to safely, and properly use equipment		X			32 01 90 Operation and Maintenance of Planting
HS		Train all staff to identify wildlife habitats and pests so they can avoid areas when using equipment.		X			32 01 90 Operation and Maintenance of Planting
G		Use alternative fuel for motorized equipment (solar or electric vs gas)					32 01 90 Operation and Maintenance of Planting

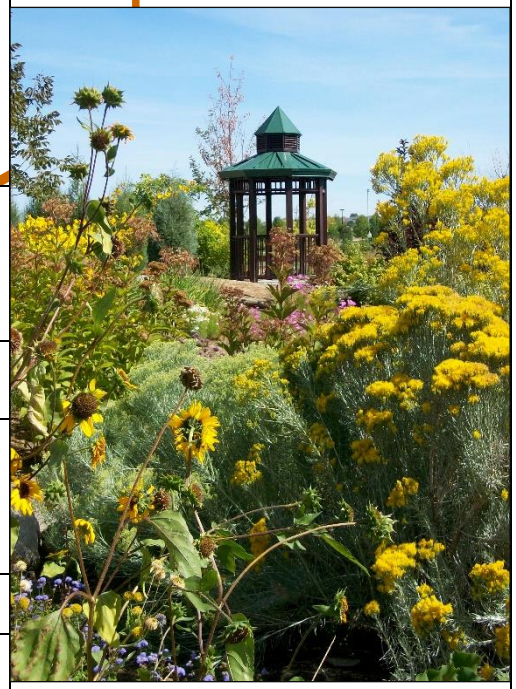
Spec Type		Practice: Mobilization	Landscape Architect	Contractor	HOA	Other	MasterFormat Section
G	**Preconstruction Meeting**	Hold a preconstruction meeting for understanding green goals among all parties-owner, general, subs, designers, maintenance	X	X	X		
	Fuel Efficiency	*Use fuel efficiently (and minimize air pollution)*					
G		Use proper equipment and use according to manufacturer's instructions		X			
G		Establish company policies that encourage fuel efficiency (e.g. carpooling, 1 vehicle to jobsite)		X			
G		Use fuel efficient vehicles		X			
G		Fuel vehicles when it's cooler		X			
G		Use hand labor if overall energy use is lower (include on-site and transportation energy)		X			
G	**Alternative Fuels**	Use alternative fuels when possible (e.g. biodiesel, ethanol, propane for trucks and equipment; electric tools powered by solar, wind)		X			
	Energy-efficient Project Management	Manage projects to reduce energy use					
G		Practice one stop shopping or shipping		X			
G		Make sure trucks are stocked		X			
G		Reduce number of trips		X			
G		Use site-specific daily task lists to get everyone and everything at the right time		X			
G		Communicate goals and objectives to crew, explain choices	X	X	X		
G		Minimize number and distance of deliveries (sequence deliveries efficiently, combine deliveries when possible, split loads, plants for multiple jobs)		X			
G		Buy in bulk, when possible but don't buy more than you need!		X	X		
G		Coordinate for construction sequencing		X	X		
G		Contract out work that can be done more efficiently by others		X	X		
G		Have good site security to minimize mobilization-lock up and move once		X			
G		Employ central coordination of resource management (ordering, delivery)		X			
G		Use professional networking-share deliveries, equipment, waste hauling		X	X		

Spec Type		Practice: Mobilization	Landscape Architect	Contractor	HOA	Other	MasterFormat Section
G	**Training**	Train crew in environmentally sound practices		X			
G	**Tracking**	Consistent communication and accountability during installation process to ensure alignment with sustainability/ habitat goals - include staff-hours in project timeline	X	X	X		
G	**Local Sourcing**	Buy local materials		X	X		
G	**Material Storage**	Store materials to prevent soil, air, & water contamination		X			
G	**Equipment Maintenance**	Maintain tools and equipment		X			
G		Repair rather than replace even when more expensive (consider embodied energy)		X			
G	**Minimize Waste**	Minimize waste hauled to dump		X			
G		Compost organic waste to the highest degree possible		X	X		
G		Separate out reusable and recyclable materials		X			
G		Recycle pallets for reuse or mulch		X			
G		Return pots and containers		X			
G		Offer reusable materials to the community for free		X	X		
G		Post unused materials on web (freecycle.org, craigslist)		X	X		

Spec Type		Practice: Evaluation	Landscape Architect	Contractor	HOA	Other	MasterFormat Section
	Evaluation	*Many practitioners don't feel they have the time for evaluating their landscapes, but regular monitoring can identify potential challenges, quantify success and help to make work plans more efficient. Budget for time to monitor for potential pests, diseases and weeds as well as documenting habitat use in each maintenance cycle - these practices help to limit damage while also providing the information needed to plant more habitats.*					
	Design legibility	*Blowback on public pollinator habitats often comes from members of the community who have different expectations from the landscape. Education, awareness and engagement can help with this, but keeping the design of a garden or planting "legible" contributes greatly to its success.*					
G		% cover – Document plant aggressiveness over time	x	x	x	x	32 01 90 Operation and Maintenance of Planting
G		% survival – Document plant survival over time and create a replacement plan.	x	x	x	x	32 01 90 Operation and Maintenance of Planting
G		Refer to the original planting list/map of each planted area if possible. Determine who is in charge of adding plants over time.	x	x	x	x	32 01 90 Operation and Maintenance of Planting
	Functionality	*Budget and aesthetic considerations; again, design and installation flaws can result in loss of functionality over time…which comes back on maintenance*					
G		Look for signs of poor drainage and erosion		x	x	x	32 01 90 Operation and Maintenance of Planting
G		Look for potential sources of disturbance and/or contamination		x	x	x	32 01 90 Operation and Maintenance of Planting
G		Measure plant establishment and density		x	x	x	32 01 90 Operation and Maintenance of Planting
	Plant health	*Monitoring during regular maintenance may identify potential health problems before they become too big to control.*					
G		Collect baseline measurements for biodiversity and plant health before planting	x	x	x	x	32 01 90 Operation and Maintenance of Planting
G		Record pest/weed/disease presence/ infestation rate		x	x	x	32 01 90 Operation and Maintenance of Planting
G		Record pest/weed/disease response to controls		x	x	x	32 01 90 Operation and Maintenance of Planting
G		Record plant response to abiotic conditions- drought, shading, etc.		x	x	x	32 01 90 Operation and Maintenance of Planting
	Biodiversity	*Thriving wildlife habitat = mark of success for well-designed landscape, providing quality of life for the community, as well as resilience and ecological function of surrounding area*					
HS		Document plant diversity - species, functional groups	x	x	x	x	32 01 90 Operation and Maintenance of Planting
HS		Document wildlife diversity - # of species		x	x	x	32 01 90 Operation and Maintenance of Planting

HS		Document wildlife abundance - counts or ratings (common, occasional, rare)		X	X	X	32 01 90 Operation and Maintenance of Planting
HS		Document wildlife patterns of use - behavioral observations		X	X	X	32 01 90 Operation and Maintenance of Planting
HS		Record seasonal resources - sufficient food resources throughout the year	X	X	X	X	32 01 90 Operation and Maintenance of Planting
HS		Citizen science projects may engage volunteers to help with this work			X	X	32 01 90 Operation and Maintenance of Planting

Spec Type			Invertebrate Habitat Requirements	MasterFormat Section
HS			*Invertebrates are a diverse group of animals and have unique requirements based on their life histories. Less than 1% of invertebrate species are considered pests - most are harmless or even beneficial. Three categories of especially beneficial invertebrates are below (soil fauna is another group of beneficial invertebrates - see "soil and groundcover" tab). Often, maintaining healthy habitat for these animals will benefit other wildlife - an ecosystem approach to landscape management.These habitats are crucial to preserving biodiversity during a time of intense change.*	
HS	**Pollinators**		Pollinators are animals that transport pollen from one flower to another, improving seed set and quality. Pollinators include bees, flies, beetles, butterflies, moths, hummingbirds and more.	
HS		Food	Nectar and pollen resources from early spring to late fall. Diversity in color, shape and size will accommodate diverse pollinators. Pollinator syndromes (i.e. bilateral symmetry for bees, white for moths) can be helpful guides for individual pollinators, but aren't law! Pollinators often have excellent sight and smell and will find food if it's available. Frequent deadheading will encourage more blooms. Simpler flowers are more easily accessible to native pollinators. Plant in swaths or clumps to aid seeking behavior. Butterflies and moths require larval hosts for egg-laying and caterpillar feeding - plan on 10 plants per larvae! Native plants recommended since these plant-animal relationships are long established for native bees, butterflies, flies and beetles.	
HS		Shelter	Layered plantings will provide structural complexity for pollinators to roost and escape predators/ weather, etc. 70% of native bees are ground-nesting, so keeping some bare soil supports them. Human-made structures can also support nesting. Boulders allow for basking in the mornings. Groundcovers, fallen leaves and winter perennials provide important protection for overwintering pollinators and larval/pupal stages.	
HS		Water	Most pollinators get water from nectar or other plant fluids. However, clean sources of water can help honeybee hives stay cool. "Mud puddles" provide important minerals for male butterflies to produce sperm - a manmade version is a shallow dish filled half with compost and half with sand and kept moist. Some pollinating flies need moist depressions for their larval stages. These larva are usually predators on aphids and other soft-bodied pests.	
HS		Space	Connectivity is key! Many native bees can fly only short distances, so spacing pollinator resources in a corridor or network with frequent "stopover" points will lead to more success. Full sun environments are more attractive to pollinators.	

Spec Type			Invertebrate Habitat Requirements	MasterFormat Section
HS	**Predators**		Predators keep pest populations low.	
HS		Food	Beneficial predators eat other insects - some are generalists, and some are specialists. Adults may also sip nectar, so flowers that are smaller (to accommodate smaller mouthparts), are clustered and provide a landing platform (members of the Apiaceae and Asteraceae, esp) are a great resource.When food source is depleted, these insects often move on and aren't seen again until the next outbreak.	
HS		Shelter	Layered plantings will provide structural complexity for pollinators to roost and escape predators/ weather, etc.Human-made structures can also support nesting. Boulders allow for basking in the mornings. Groundcovers, fallen leaves and winter perennials provide important protection for overwintering beneficials and larval/pupal stages.	
HS		Water	Most predators get water from nectar or other plant fluids, or from their prey. Predators such as syrphid flies need moist spaces for their larva	
HS		Space	Connectivity is key! These insects (some clumsy fliers like ladybeetles, some tiny parasitoid wasps) can fly only short distances, so spacing pollinator resources in a corridor or network with frequent "stopover" points will lead to more success. Full sun environments are more attractive to predators and parasitoids.	
HS	**Aquatics**		Many aquatic invertebrates also eat pests such as mosquitos and are indicators of aquatic health.	
HS		Food	Dragonflies and damselflies are carnivores, eating smaller insects both as nymphs and adults. Adults hunt in wide open spaces with good light and good air circulation.	
HS		Shelter	Nymphs will hang on to the stems of plants underwater and use them to hide from predators. Adults will perch to patrol their territories, but also use denser plantings to escape weather and predators.	
HS		Water	Water quality is very important since they spend their nymph stages underwater. Water should also be moving, clear and be surrounded by plants.	
HS		Space	Dragonflies and damselflies are excellent fliers and will travel far to search for prey and mates. Open areas near water are most attractive to them.	

Spec Type	Bird Habitat Requirements	MasterFormat Section
HS	Native shrubs have exceptional value for birds, fruit and flowers may be food, more importantly insects on native shrubs are critical forage	
HS	96 percent of all terrestrial birds feed on insects particularly during the breeding season	
HS	Over pruning reduces cover for birds	
HS	Not allowing shrubs to reach their full height limits nesting opportunities.	
HS	Neonicotinoid pesticides are highly toxic to birds	
HS	Avoid pruning when plants are bearing fruit (to preserve forage)	
HS	Avoid pruning large shrubs during the nesting season	
HS	Avoid mowing natural areas during the nesting season (March 15 -June15)	
HS	Providing water (particularly in winter) is highly beneficial)	
	Common threats to backyard birds	
HS	U.S. Fish and Wildlife Service concluded that cats kill up to 3.7 billion birds each year	
HS	Up to one billion birds are killed in the US each year by building with reflective windows (use decals)	
HS	Fishing lines and other trash can kill birds	
HS	Rodenticide placed outdooors can move up the food chain killing raptors	

Civil Sections

311000 Site Clearing
312000 Earth Moving
313000 Earthwork Methods - this section deals with rodent, insect, and vegetation control
Landscape Architect Typically Edits These
32 00 00 Exterior Improvements (Everything Landscape Architects do will go in these sections)
32 01 00 Operation and Maintenance of Exterior Improvements
32 01 11 Paving Cleaning
32 01 30 Operation and Maintenance of Site Improvements
32 01 30.13 Snow Removal
32 01 80 Operation and Maintenance of Irrigation
32 01 90 Operation and Maintenance of Planting
32 01 90.13 Fertilizing
32 01 90.16 Amending Soils
32 01 90.19 Mowing
32 01 90.23 Pruning
32 01 90.26 Watering
32 01 90.29 Topsoil Preservation
32 01 90.33 Tree and Shrub Preservation
32 90 00 Planting
32 91 00 Planting Preparation
32 91 13 Soil Preparation
32 91 13.16 Mulching
32 91 13.26 Planting Beds
32 91 19 Landscape Grading
32 91 19.13 Topsoil Placement and Grading
32 92 00 Turf and Grasses
32 92 19 Seeding
32 92 23 Sodding
32 93 00 Plants
32 93 13 Ground Covers
32 93 23 Plants and Bulbs
32 93 33 Shrubs
32 93 43 Trees
32 94 19 Landscape Surfacing

Habitat Friendly Maintenance Through the Seasons

After we have designed and installed a suitable landscape for our Western climate, it's essential that our garden management practices align with the goals of creating and supporting wildlife habitat. However, the practices of many landscape management companies are directly counter to the goals of gardening for wildlife.

This natural gardening style provides four-season interest, but there are other important reasons not to cut back plants until spring. The bright winter sunshine in the Rocky Mountain West can cause the ground to freeze and thaw repeatedly. This continual freezing and thawing can be hard on plants. Leaving the previous season's growth to shade the ground can minimize this while retaining moisture at the roots.

Winter

In Winter insects may be hibernating in the hollow stems of plants in our winter garden. By removing old growth too early, we can unknowingly be removing beneficial pollinators.

Winter can be a difficult time for birds, and they can often be seen picking through leaves, seeking insects on a warm winter day, picking the last few seeds from dried flower heads, and nibbling persistent fruits softened by the frost.

Spring

When insects emerge from dormancy old growth on grasses and perennials flowers can be cut to the ground. This is the biggest season chore in the habitat friendly garden. Fertilization is typically not needed in garden comprised of native plants.

Managing weeds at this stage is important. Later in the season the established plants will help to suppress weeds through competition and by covering up the bare ground.

Summer

Insects like aphids are generally not an ongoing problem. If they become unsightly, they can simply be washed off with a hose. Typically, aphids only persist when the weather is around 70°F. In the hot and dry summer season, they usually subside.

Dead heading can help some plants rebloom but when done excessively can prevent plants from regenerating and filling in bare space, as well as reducing seeds for foraging birds.

Autumn

One of the unique and wonderful things about gardening in the West is the way that landscapes persist in winter, like dried floral arrangements that last until spring. Looking out on the winter landscape, the faded colors of dried grasses and snowcaps on dried flowers are beautiful in their own right and remind us of the summer garden.

Fallen leaves are often removed in traditional landscape maintenance, but this is considered unnecessary, even unhelpful, from the perspective of habitat friendly maintenance.

OUR TEAM

Deryn Davidson, Horticulture Extension Agent

Deryn Davidson holds a B.S. in Horticulture from Colorado State University and a Master's of Landscape Architecture from the University of Arizona. Her passion for native plants and pollinators grew during her time as a horticulturist at the Ladybird Johnson Wildflower Center in Austin, TX.

Currently, Deryn is the CSU Horticulture Extension Agent for Boulder County, a position in which she enjoys combining her training and experience in design and horticulture with ecological function and helping people discover new ways to bring native plants into urban environments. Deryn is passionate about educating the public on the importance of pollinators and their habitat, appropriate landscape design and responsible horticultural practices.

Josh Orth, Landscape Architect

Josh Orth is a licensed Landscape Architect and Principal at Norris Design. He entered the industry with a desire to make a difference. During his 20 years in practice, Josh has incorporated his passion for naturalized landscapes into many Colorado Front Range master planned communities.

Josh often takes inspiration from his adventurous excursions — exploring the roads less traveled — then incorporating these ideas into new landscapes as a way of promoting environmental stewardship and reactivating spaces that may sometimes be overlooked.

Josh recently relocated to Norris Design's office in Tucson, Arizona from Denver, Colorado. He is currently expanding his practice to focus on policies for water management, environmental stewardship and water reclamation. He continues to practice traditional landscape architecture on master planned communities, multifamily developments, commercial developments and institutional projects. Additionally, Josh oversees Norris Design's Construction Services division, which offers expertise on implementation through operations of properties for various scales.

Jim Tolstrup, HPEC Executive Director

Jim Tolstrup is the Executive Director of the High Plains Environmental Center in Loveland, CO, a unique model for preserving native biodiversity in the midst of development. His past work experience includes serving as Land Stewardship Director of Shambhala Mountain Center in Red Feather Lakes, CO and running his own landscape design business in Kennebunkport, Maine where he installed gardens at George and Barbara Bush's "Summer White House."

Jim holds a Certificate in Gardening Arts from the Landscape Institute of Harvard University and the Arnold Arboretum, he has written numerous articles on gardening and environmental stewardship for various publications and is a past recipient of Denver Water's Xeriscape Award, ALCC's Excellence in Landscaping Merit Award, ASLA Land Stewardship Award and the Sustainable Living Association's Sustainable Contribution Award.

Jim is personally committed to bringing together people with diverse points of view (environmentalists, businesspeople, and other community members) in an inclusive dialogue about preserving the natural world for future generations.

Amy Yarger, Horticulture Director

Amy Yarger has worked in the public horticulture field since 1996. She received a bachelor's degree in ecology and evolutionary biology at the University of California, Irvine and then went on to study plant-animal interactions at the University of Michigan. Her master's thesis concerned the effects of invasive weeds on pollinator-plant relationships. Her work at the Butterfly Pavilion, where she has worked since 2000, touches on many of her passions: plants, insects, habitat conservation and science education.

She currently leads the Urban Prairies Project, which restores habitat in urban and suburban green spaces in Westminster and Broomfield. Amy has also installed pollinator habitat gardens throughout the community at locations such as Sprout City Farms, Clear Creek Valley Park and Good Samaritan Hospital. Her articles have been published in Colorado Gardener, Aquilegia and the journal for the Association for Zoological Horticulture. Through habitat gardening and education, Amy hopes to create a closer connection to nature and a greater understanding about the need for biodiversity locally and globally.

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