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ADOT Vegetation Management Guidelines - Mowing

1.0 Purpose of Mowing

Mowing can have varying effects on plant growth depending on timing and method. Therefore, it is important to have the goals in mind of appropriate operations prior to planning mowing activities. Mowing should be used selectively in roadside vegetation management for specific purposes, such as:

- Improving horizontal sight distance at intersections and cross streets
- Maintaining visibility of hazard markers, guardrails, and delineators
- Controlling weeds and tree/brush seedlings, often coordinated with herbicide use
- Reducing snowdrift
- Reducing summer fire fuels
- Increasing vegetative growth in native grass species to encourage seed production

Mowing the roadway edge can reduce fire fuels and wildlife grazing.

Maintaining healthy native plants on the roadside reduces effects of soil erosion, dust, and decreases the establishment of weeds and invasive plants. Mowing can shorten the lifespan and health of plants depending on the timing, frequency, and height at which plants are cut. Mowing causes grasses and broad-leaf plants to deplete energy stored in their root systems. If plants are mowed too often, too short (under six inches), or during the growing season before they transfer energy to the roots, they may not live to regrow the next year. Wait until late in the growing season and mow at a minimum height of six inches in areas with desirable plants and grasses. Mowing later in the season also allows seeds to fall, leading to more new plants the next year.

For grasses, mowing during the active growing season can cause the next growth to be shorter and spread out more. The shorter the grass is mowed, the closer to the ground it will grow, causing the grass to spread. Note that when comparing to invasive species, grass root systems are bunched and closer to the topsoil. This is preferable so as to prevent roadside erosion.

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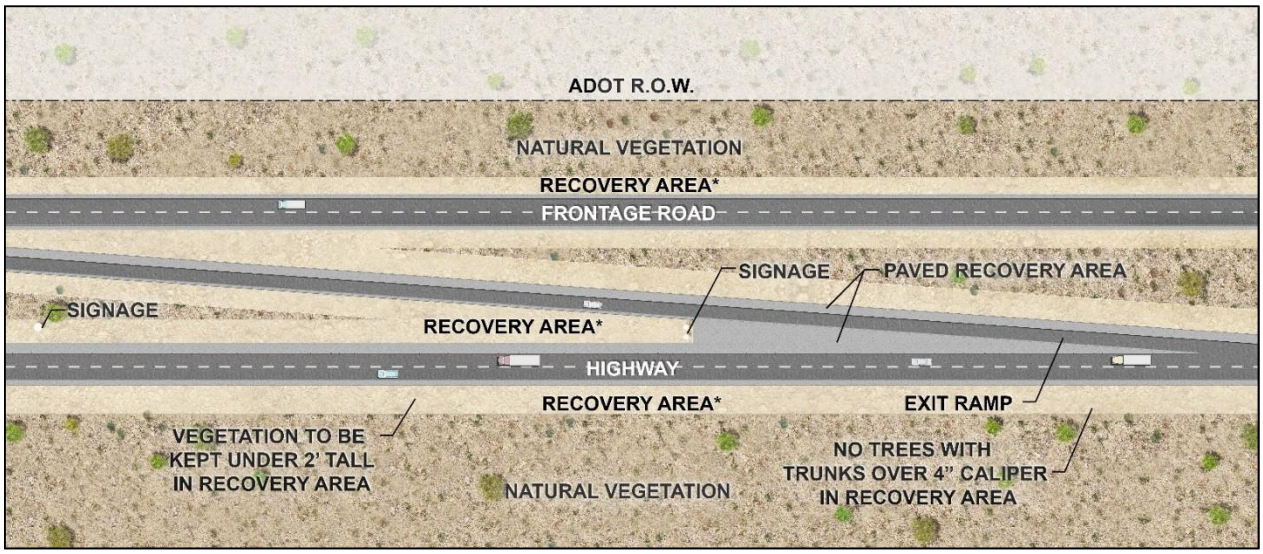
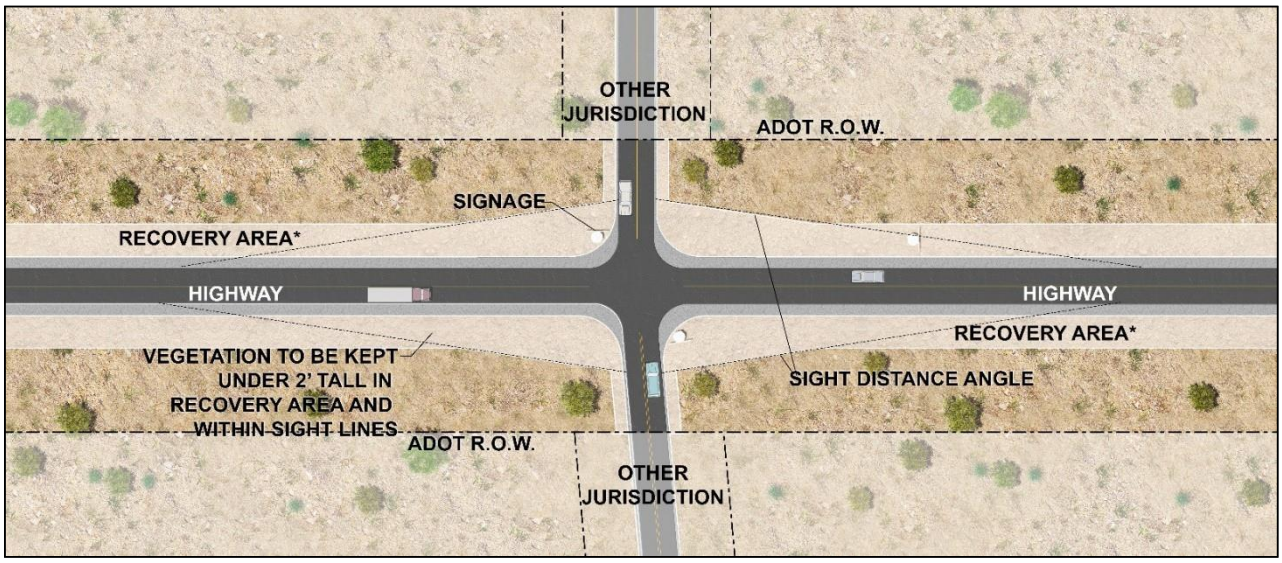
ADOT Vegetation Management Guidelines - Mowing

Recovery Areas

Mowing is an important tool for keeping the recovery area along the roadway clear. The diagrams below illustrate recovery areas along a frontage road and at a highway intersection. See Appendix B for more information on recovery area widths.



Recovery area along frontage road



Recovery area at highway intersection

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ADOT Vegetation Management Guidelines - Mowing

2.0 Planning to Mow

Cost vs. Benefits

Mowing fewer times throughout the year can have several short and long-term benefits, including:

- Fewer staff hours spent mowing, allowing staff to perform other maintenance activities
- Reduced fuel usage
- Reduced vehicle emissions and dust creation, contributing to improved air quality
- Reduced equipment maintenance
- Habitat conservation for pollinators and other wildlife

Pollinators benefit when more flowers can bloom as a result of reduced mowing.

Seasonality and When to Mow

To determine best mowing times, ADOT vegetation managers must consider several external factors, such as: the type of vegetation (native vs. undesirable plants), the overall health of the vegetation, the life cycle of the plants, and current environmental conditions (such as drought). Refer to the Recommended Mowing Times for Native Roadside Vegetation table on page 6.

Other considerations may include the following:

- Do not mow during high fire-danger periods.
- Do not mow when desirable plants are blooming or before the seed has set so that they can reseed for the next year.
- Use extra caution when mowing during breeding times for local wildlife such as birds and butterflies (typically spring and summer into fall, depending on elevation); avoid mowing during these seasons to the extent possible.

If mowing undesirable vegetation (weeds):

- Mowing prior to spraying herbicide is not a good practice because it will reduce the plant surface area necessary to absorb the herbicide, therefore decreasing the effectiveness of application.
- Do not mow noxious and invasive weeds unless it is part of a larger scale plan to manage those species. Mowing weeds can spread seeds and plant parts to new areas, making the problem worse over time.
- When coordination has taken place to manage a weed infested area, mowing must occur before the weeds flower, to avoid seed set and spread of seeds to other areas.

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ADOT Vegetation Management Guidelines - Mowing

If mowing desirable vegetation to reduce height to maintain sight lines, reduce fire danger, or for snow management:

- It is better to mow the vegetation ONCE annually or less frequently, during the non-growing season. Mowing during the non-growing season makes infrequent mowing more effective.
- Where the roadside vegetation consists of predominantly native species, mowing must be timed to occur after desirable plants have set seed and the seed has been dispersed.
- Do not mow desirable plants near the end of the growing season, when plants are nearing dormancy and are less resilient. Growing seasons vary by region; refer to the chart below.
- If desirable vegetation needs to be mowed during the growing season, it is best to mow when the vegetation is healthy and actively growing as a result of adequate moisture received during the previous winter as rain or snow, or following the summer monsoon rains.
- Desirable vegetation that is severely drought-stressed must not be mowed, because the plants may not recover.

Arizona Native Plant Laws

ADOT is required to follow native plant laws made by the Arizona Department of Agriculture. These laws are in place to protect and benefit native vegetation. This includes identification of native vegetation and invasive plants that have been declared as noxious weeds by the Department of Agriculture. Please refer to the Arizona Department of Agriculture website for a comprehensive list of native plants protected under these laws, list of invasive or noxious weeds, and most up to date laws and regulations.

Monarchs and Milkweed

ADOT has entered into a conservation agreement for the monarch butterfly (*Danaus plexippus*). As part of this agreement, ADOT has developed best mowing practices that align with timing of monarch migration and milkweed availability (the only food source of monarch larvae and preferred host plant for monarch eggs). Since Arizona is home to a variety of milkweed species and other pollinator-friendly plants, it is extremely important for ADOT to keep these factors in mind when planning to mow in areas where milkweed may be present. Refer to the mowing chart below for information on recommended times to mow native vegetation across the state. (Note: most up to date monarch migration data obtained on June 17, 2024 from Southwest Monarch Study - https://swmonarchs.org/peakmigration.php and iNaturalist - https://www.inaturalist.org/taxa/48662-Danaus-plexippus)

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ADOT Vegetation Management Guidelines - Mowing

Recommended Mowing Times for Native Roadside Vegetation

This table shows mowing times for roadside areas with native vegetation to promote reseeding and habitat quality and to protect monarch caterpillars and butterflies. Mowing must be used selectively and only where needed, such as in targeted areas to prevent snow drift, to manage invasive species, or to maintain sightlines, sign and guardrail visibility.

For 2 to 3 years following seeding, do not mow unless absolutely necessary and do not mow shorter than 6 inches.

Biozone						Highest Temperatures						
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Conifer Forest	Best[1]	Best[1,3]	Okay[1,3]	No[2,3]	No[2,3]	Okay[3]	Okay[3,4]	No[3,4]	No	No	Best[1]	Best[1]
Monarch Migration Season	-	-	-	-	-	-	-	✓	✓	✓	-	-
Great Basin Conifer Woodland	Best[1]	Best[1,3]	Best[1,3]	No[2,3]	No[2,3]	Okay[3]	Okay[3,4]	No[3,4]	Okay[3]	No	Best[1]	Best[1]
Monarch Migration Season	-	-	-	-	-	-	-	✓	✓	✓	-	-
Chaparral	Best	Best	Okay[3,5]	No[2,3]	No[2,3]	Okay[3]	Okay[3,4]	Okay[3,4]	Okay[3]	Okay	Best	Best
Monarch Migration Season	-	-	-	–	–	–	-	-	✓	✓	-	-
Plains and Great Basin Grassland	Best[1]	Best[1]	Best[1,3]	No[2,3]	No[3]	Okay[3]	No[3,4]	No[3,4]	No[3]	Best	Best	Best[1]
Monarch Migration Season	-	-	-	-	✓	-	✓	✓	✓	–	-	-
Semidesert Grassland & Chihuahuan Desertscrub	Best	Best	Best[3]	Okay[1,3]	No[2,3]	No[2,3]	No[3,4]	No[3,4]	No[2]	Okay	Best	Best
Monarch Migration Season	-	-	-	-	–	✓	✓	✓	✓	–	-	-
Great Basin Desertscrub	Best[1]	Best[1]	Best[1,3]	Okay[1,3]	No[2,3]	No[2,3]	Okay[3,4]	Okay[3,4]	No[4]	No[2]	Best[1]	Best[1]
Monarch Migration Season	-	-	-	-	✓	✓	-	-	✓	✓	-	-
Sonoran & Mohave Desertscrub	No[2]	No[2]	No[2,3]	No[2,3]	No[2,3]	Okay[3]	Okay[3,4]	Okay[3,4]	No	No	No[2]	Best
Monarchs May Be Present	✓	✓	✓	-	-	–	-	-	✓	✓	✓	-

Notes:

Colors in table correspond to the colors in the biozones map (see Appendix C)

[1]Okay to mow if no snow or excessive mud

[2]Desirable plants are in sensitive growth stage; mow in targeted locations for weed control only

[3]Follow migratory bird measures

[4]Highest rainfall season; don't mow in muddy conditions; consider waiting since plants will regrow rapidly following rains

✓ Monarch migration season represented with checkmark; do not mow if milkweed is present or if nectar plants are blooming unless absolutely necessary.

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3.0 Activity Coordination

Coordination within ADOT

It is highly recommended to plan the mowing schedule at least 6 months ahead and share the information with the District Environmental Coordinator (DEC) and District Herbicide Contact to allow ample time for coordination on environmental concerns and herbicide treatments. If the area to be mowed has excessive litter or debris, coordinate for litter to be collected prior to mowing to avoid shredding the litter into smaller pieces.

COORDINATION

WHO TO CALL

- Maintenance Supervisor
- District Environmental Coordinator
- Environmental Planning Operations (https://azdot.gov/business/environmental-planning/operations-environmental-planning)

Notify the District Herbicide/Invasive Species Contact and the DEC, no less than 10 work days prior to mowing for information on site status to avoid damage to plant communities, spreading noxious weeds, or conflicting with herbicide treatments.

Environmental Concerns

Prior to mowing, maintenance staff must consult with their Maintenance Supervisor to ensure that requirements of laws, rules, and regulations have been addressed. In particular, coordination is always required ahead of mowing in the ROW in the following areas:

- National Forests (coordinate with the Forest Ranger District)
- Native American Tribal Communities
- Environmentally sensitive areas containing endangered species habitat and/or cultural resources.
- The Maintenance Supervisor or DEC may submit an Environmental Maintenance Work Order for assistance from ADOT Environmental Planning. The form is available on the ADOT intranet in Construction / Maintenance Essential Documents. Refer to the instructions on the bottom of the Maintenance Work Order Form for contact information.

4.0 Best Practices for Mowing

Mowing can affect the vigor of roadside plants, so it is important to follow best practices. To prevent the spread of noxious invasive weeds, mowers must be thoroughly cleaned before mowing and between mowing locations. Sites must be surveyed prior to mowing to look for hazards such as large rocks and features such as check dams that must be avoided.

Mowing Height

If the goal is to reduce the height of desirable vegetation:

- Mow at the end of the growing season or during the winter (when vegetation is going into dormancy). Avoid mowing when plants are coming out of dormancy at the beginning of the growing season.
- Mow only when vegetation is over 17 inches.

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- The minimum mowing height is six (6) inches. Mowing height may be reduced to a minimum of four (4) inches for winter snowstorm preparation.
- Small saplings and brush (stems up to 2 inches in diameter) within the mowing cut swath must be mowed to the same height as grasses and broadleaf plants.

Mowing Width

- Restrict mowing to one (1) mower width or "swath" (typically 10-12 feet wide) located immediately next to the pavement edge.
- Mow around guardrail out to a distance of 18 inches to reduce potential for trapping sand, snow, and dirt.
- Adjust mowing width to meet the requirements of specific conditions, including:
    - Sight line areas at intersections and cross-overs
    - Areas with a narrow right-of-way strip
    - Areas with weed infestations
- Mow in smooth lines that follow the landform and site features.
- See the Roadside Zones Diagram for additional information on mowing width.

Mowed Roadside

General Mowing Practices

- Mowers must be operated only in the direction of normal traffic flow when working within 30 feet of the edge of pavement.
- Mowing equipment must be operated at the optimum speed that safely produces clean cutting results, without digging into the soil, or throwing rocks and debris onto the roadway.
- Vegetation must be mowed cleanly around the bases of traffic signs, milepost/kilometer signs, delineators, and other highway fixtures.
- Pavement must be left free of debris and cuttings.
- During times of drought and high fire danger land managing agencies may require additional fire suppression equipment and tools. Check with the land owner prior to mowing in high fire danger areas.
- When mowing has been done in an area with noxious weeds, the mowers shall be thoroughly cleaned by air-blowing or washing to prevent the spread of weeds before moving to an area without weeds.

WHO TO CALL WITH QUESTIONS

Maintenance Supervisor
District Herbicide/Invasive Species Contact (see map here) District Environmental Coordinator
Design Landscape Architect – ADOT Roadside Development
Construction Landscape Architect –ADOT Construction Group

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5.0 Mowing Equipment

The two basic types of mowers – rotary and flail – may be side mounted or rear mounted. Each type has its pros and cons.

Rotary Mowers, also known as brush hogs, have large, thick blades that slice through vegetation by sucking it upward and cutting it with horizontally spinning blades, then expelling the pieces of vegetation. This type of mower is best used to quickly clear overgrown vegetation. The blades are not flexible and so can be damaged by rocks or other landscape features.

Flail Mowers have a long shaft to which individual knives are attached. The shaft operates parallel to the ground and the knives spin around the shaft. Flail mowers chop up and mulch vegetation thoroughly, providing a clean and well-manicured look to the mowed area. Rocks, stumps, or other obstructions are less likely to damage a flail mower than a rotary mower.
In general, rotary mowers are faster than flail mowers at clearing an area, but the end result will appear rougher.

Tractors with side deck rotary mower can be used to mow one swath from the side or the rear decks can be used to mow three swaths 15' wide total – best for medians on the interstate.

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ADOT Vegetation Management Guidelines - Mowing

Tractor with side deck rotary mower, rear view

Two deck rotary mower can be used to mow one five foot swath or two swaths 10' wide total depending on the terrain.

Two deck rotary mower

Two deck rotary mower, rear view

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Flail mower

Flail mower