

BMP Type	Best Practice	Sources
IPM	Use cultural, physical, and biological controls and select insect resistant/tolerant crop varieties to avoid or reduce pest risk.	Minnesota Department of Agriculture, Water Quality Best Management Practices for Agricultural Use of Clothianidin and Imidacloprid. March 2023. Water Quality Best Management Practices for Agricultural Use of Clothianidin and Imidacloprid WRL Digital Asset Management (mnpals.net) , Turf & Ornamental Best Management Practices for Pollinator Protection, NE Vegetable Management Guide 2024
IPM	Scout fields regularly and use economic thresholds to help determine if, when, and where to apply	Minnesota Department of Agriculture, Water Quality Best Management Practices for Agricultural Use of Clothianidin and Imidacloprid. March 2023. Water Quality Best Management Practices for Agricultural Use of Clothianidin and Imidacloprid WRL Digital Asset Management (mnpals.net) , Best Management Practices for Vermont Golf Courses Best Management Practices for Vermont Golf Courses, second edition. 2022. vermont-bmps.pdf (gcsaa.org) , Turf & Ornamental Best Management Practices for Pollinator Protection, NE Vegetable Management Guide 2024
IPM	Use hot-spot spraying and banding where appropriate to reduce the amount of pesticide applied.	Minnesota Department of Agriculture, Water Quality Best Management Practices for Agricultural Use of Clothianidin and Imidacloprid. March 2023. Water Quality Best Management Practices for Agricultural Use of Clothianidin and Imidacloprid WRL Digital Asset Management (mnpals.net)
IPM	Rotate clothianidin and imidacloprid with other insecticides with different mode of action, such as synthetic pyrethroids, organophosphates, and insect growth regulators that are known to be effective.	Minnesota Department of Agriculture, Water Quality Best Management Practices for Agricultural Use of Clothianidin and Imidacloprid. March 2023. Water Quality Best Management Practices for Agricultural Use of Clothianidin and Imidacloprid WRL Digital Asset Management (mnpals.net) , NE Vegetable Management Guide 2024
IPM	Avoid a sequential foliar application of clothianidin/imidacloprid following a seed, soil, or foliar application of clothianidin/imidacloprid.	Minnesota Department of Agriculture, Water Quality Best Management Practices for Agricultural Use of Clothianidin and Imidacloprid. March 2023. Water Quality Best Management Practices for Agricultural Use of Clothianidin and Imidacloprid WRL Digital Asset Management (mnpals.net)
IPM	Consider using precision application technology (e.g., auto-steer, auto-boom shutoff, and variable rate sprayer) to avoid overspray, spray overlap, and higher than recommended application rates.	Minnesota Department of Agriculture, Water Quality Best Management Practices for Agricultural Use of Clothianidin and Imidacloprid. March 2023. Water Quality Best Management Practices for Agricultural Use of Clothianidin and Imidacloprid WRL Digital Asset Management (mnpals.net)
IPM, Pollinator Protection	Avoid using pesticides or tank mixing pesticides and adjuvants that are known to synergize with each other creating a higher risk to pollinators.	Cornell University, A Guide to Reducing Pesticide Risk to Bees in Tree fruit Orchards. 2023. Pesticide Decision Guide - 2023 - Orchards.pdf , Cornell University, A Pesticide Decision Making Guide to Protect Pollinators in Landscape, Ornamental, and Turf Management. 2019.
IPM	Use spot sprays, perimeter trap crop treatments, refuge plantings, and other methods that prevent the entire field or population from being treated to help preserve susceptible individuals.	NE Vegetable Management Guide 2024
IPM, Pollinator Protection	Time the application so that the most vulnerable insect life stage is exposed to the spray.	NE Vegetable Management Guide 2024

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IPM, Off Target Movement	Use equipment appropriately (appropriate level of pressure on a well-calibrated and frequently maintained sprayer).	Minnesota Department of Agriculture, Stewardship Guidelines and Best Management Practices for Use of Soil and Foliar-applied Agricultural Neonicotinoid Insecticides. July 2019. Soil and Foliar Neonicotinoid Guide (state.mn.us) , Honey Bee Health Coalition, Best Management Practices (BMPs) for Pollinator Protection in Field Corn. February 2020. HBHC_Corn_022020.pdf (honeybeehealthcoalition.org) , Best Management Practices for Vermont Golf Courses Best Management Practices for Vermont Golf Courses, second edition. 2022. vermont-bmps.pdf (gcsaa.org)
Off Target Movement	Select nozzles that produce medium or coarser droplet sizes (200-400 microns, ASABE S572.I). Use the coarsest droplet size possible without compromising the efficacy.	Minnesota Department of Agriculture, Water Quality Best Management Practices for Agricultural Use of Clothianidin and Imidacloprid. March 2023. Water Quality Best Management Practices for Agricultural Use of Clothianidin and Imidacloprid WRL Digital Asset Management (mnpals.net) , Honey Bee Health Coalition, Best Management Practices (BMPs) for Pollinator Protection in Field
Off Target Movement, Pollinator Protection	Monitor weather and apply during favorable conditions (wind speeds 3 to 15 mph, temperatures <85.F, relative humidity >50%, no temperature inversions, at night if necessary)	Minnesota Department of Agriculture, Water Quality Best Management Practices for Agricultural Use of Clothianidin and Imidacloprid. March 2023. Water Quality Best Management Practices for Agricultural Use of Clothianidin and Imidacloprid WRL Digital Asset Management (mnpals.net) , Walgenbach, J. North Carolina State University Extension Entomologist. Pollinator Protection in Apples. Pollinator-Protection-in-Apples_Walgenbach.pdf (pesticidestewardship.org)
Off Target Movement	Maintain at least a 25 ft spray buffer zone between the application area and surface water for ground applications and a 150 ft spray buffer zone for aerial applications.	Minnesota Department of Agriculture, Water Quality Best Management Practices for Agricultural Use of Clothianidin and Imidacloprid. March 2023. Water Quality Best Management Practices for Agricultural Use of Clothianidin and Imidacloprid WRL Digital Asset Management (mnpals.net)
Off Target Movement	Maintain a boom height no more than 4 ft above the canopy for ground applications and no more than 10 ft above the canopy for aerial applications.	Minnesota Department of Agriculture, Water Quality Best Management Practices for Agricultural Use of Clothianidin and Imidacloprid. March 2023. Water Quality Best Management Practices for Agricultural Use of Clothianidin and Imidacloprid WRL Digital Asset Management (mnpals.net)
Off Target Movement	Consider using drift retardants or spray additives within label guidance.	Minnesota Department of Agriculture, Water Quality Best Management Practices for Agricultural Use of Clothianidin and Imidacloprid. March 2023. Water Quality Best Management Practices for Agricultural Use of Clothianidin and Imidacloprid WRL Digital Asset Management (mnpals.net) , Honey Bee Health Coalition, Best Management Practices (BMPs) for Pollinator Protection in Field Corn. February 2020. HBHC_Corn_022020.pdf (honeybeehealthcoalition.org)
Off Target Movement	Consider using shielded sprayers if shields do not compromise uniform deposition.	Minnesota Department of Agriculture, Water Quality Best Management Practices for Agricultural Use of Clothianidin and Imidacloprid. March 2023. Water Quality Best Management Practices for Agricultural Use of Clothianidin and Imidacloprid WRL Digital Asset Management (mnpals.net) , Honey Bee Health Coalition, Best Management Practices (BMPs) for Pollinator Protection in Field Corn. February 2020. HBHC_Corn_022020.pdf (honeybeehealthcoalition.org) , Honey Bee Health Coalition, Best Management Practices (BMPs) for Pollinator Protection in Field
Off Target Movement, Pollinator Protection	Spray when wind direction is pointed away from non-target areas of concern, e.g. hives and pollinator habitat.	Corn. February 2020. HBHC_Corn_022020.pdf (honeybeehealthcoalition.org) , Honey Bee Health Coalition, Apple Best Management Practices. USApple-Pollinator-BMPs-Final.pdf (honeybeehealthcoalition.org) , Honey Bee Health Coalition, Best Management Practices (BMPs) to Protect Honey Bees and Other Pollinators in Soybean Fields. February 2020. HBHC_Soybean_022020.pdf (honeybeehealthcoalition.org)
Off Target Movement, Pollinator Protection	Use field buffers (i.e., beginning your application a certain distance from the edge of the field) as appropriate, especially if hives or plants that flower are close to the field being sprayed.	Honey Bee Health Coalition, Best Management Practices (BMPs) for Pollinator Protection in Field Corn. February 2020. HBHC_Corn_022020.pdf (honeybeehealthcoalition.org)
Off Target Movement	Be Aware of Temperature Inversions	Minnesota Department of Agriculture, Stewardship Guidelines and Best Management Practices for Use of Soil and Foliar-applied Agricultural Neonicotinoid Insecticides. July 2019. Soil and Foliar Neonicotinoid Guide (state.mn.us)

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Off Target Movement	Mix and load pesticides away from waterbodies and ditches and use a designated spill containment surface. If a containment pad is unavailable, maintain a 25 ft distance from potential surface to groundwater conduits.	Minnesota Department of Agriculture, Water Quality Best Management Practices for Agricultural Use of Clothianidin and Imidacloprid. March 2023. Water Quality Best Management Practices for Agricultural Use of Clothianidin and Imidacloprid WRL Digital Asset Management (mnpals.net)
Off Target Movement	Be prepared for potential spills by developing and maintaining an incident response plan.	Minnesota Department of Agriculture, Water Quality Best Management Practices for Agricultural Use of Clothianidin and Imidacloprid. March 2023. Water Quality Best Management Practices for Agricultural Use of Clothianidin and Imidacloprid WRL Digital Asset Management (mnpals.net)
Off Target Movement	DO NOT pour leftover pesticide down a drain or in a single spot in a field.	Minnesota Department of Agriculture, Water Quality Best Management Practices for Agricultural Use of Clothianidin and Imidacloprid. March 2023. Water Quality Best Management Practices for Agricultural Use of Clothianidin and Imidacloprid WRL Digital Asset Management (mnpals.net)
Off Target Movement	Avoid applying during rain or when soil is saturated which favors runoff. Avoid foliar applications if rain is predicted in the next 24 or 48 hours.	Minnesota Department of Agriculture, Water Quality Best Management Practices for Agricultural Use of Clothianidin and Imidacloprid. March 2023. Water Quality Best Management Practices for Agricultural Use of Clothianidin and Imidacloprid WRL Digital Asset Management (mnpals.net)
Off Target Movement, Label	Construct and maintain a vegetative filter strip at least 10 ft wide between the field edge and nearby down gradient aquatic habitat. Check product labels for exact width requirements, which may vary.	Minnesota Department of Agriculture, Water Quality Best Management Practices for Agricultural Use of Clothianidin and Imidacloprid. March 2023. Water Quality Best Management Practices for Agricultural Use of Clothianidin and Imidacloprid WRL Digital Asset Management (mnpals.net)
Off Target Movement	Maintain grass or vegetation buffers near tile outlets, in drainage ways, and along field boundaries.	Minnesota Department of Agriculture, Water Quality Best Management Practices for Agricultural Use of Clothianidin and Imidacloprid. March 2023. Water Quality Best Management Practices for Agricultural Use of Clothianidin and Imidacloprid WRL Digital Asset Management (mnpals.net)
Off Target Movement	Consider residue management practices such as adopting conservation tillage and planting a cover crop to help slow runoff.	Minnesota Department of Agriculture, Water Quality Best Management Practices for Agricultural Use of Clothianidin and Imidacloprid. March 2023. Water Quality Best Management Practices for Agricultural Use of Clothianidin and Imidacloprid WRL Digital Asset Management (mnpals.net)
Off Target Movement	Avoid practices that lead to soil compaction (e.g., tillage of wet soil) and, in turn, increase runoff.	Minnesota Department of Agriculture, Water Quality Best Management Practices for Agricultural Use of Clothianidin and Imidacloprid. March 2023. Water Quality Best Management Practices for Agricultural Use of Clothianidin and Imidacloprid WRL Digital Asset Management (mnpals.net)
Off Target Movement	Use soil moisture monitoring techniques, such as sensors, to avoid over-irrigation and runoff.	Minnesota Department of Agriculture, Water Quality Best Management Practices for Agricultural Use of Clothianidin and Imidacloprid. March 2023. Water Quality Best Management Practices for Agricultural Use of Clothianidin and Imidacloprid WRL Digital Asset Management (mnpals.net)
Label, IPM	Use the lowest labeled application rate that will effectively control the pest. Recommended application rates vary with the target pest species. Avoid applying below labeled rates which can compromise efficacy and favor the development of insecticide resistance.	Minnesota Department of Agriculture, Water Quality Best Management Practices for Agricultural Use of Clothianidin and Imidacloprid. March 2023. Water Quality Best Management Practices for Agricultural Use of Clothianidin and Imidacloprid WRL Digital Asset Management (mnpals.net)
Label	Follow label restrictions for the maximum amount of clothianidin/imidacloprid allowed per acre, per application, per season, or per year. Pesticide applied as seed treatments counts toward maximum application rates.	Minnesota Department of Agriculture, Water Quality Best Management Practices for Agricultural Use of Clothianidin and Imidacloprid. March 2023. Water Quality Best Management Practices for Agricultural Use of Clothianidin and Imidacloprid WRL Digital Asset Management (mnpals.net)
Label, IPM	Always follow all label directions and adopt proposed risks mitigation practices when possible.	Minnesota Department of Agriculture, Water Quality Best Management Practices for Agricultural Use of Clothianidin and Imidacloprid. March 2023. Water Quality Best Management Practices for Agricultural Use of Clothianidin and Imidacloprid WRL Digital Asset Management (mnpals.net)
Pollinator Protection	Mow the area immediately before application to remove blossoms from flowering weeds or use herbicides to reduce weed populations	Best Management Practices for Vermont Golf Courses Best Management Practices for Vermont Golf Courses, second edition. 2022. vermont-bmps.pdf (gcsaa.org)

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Pollinator Protection	If possible, select a pesticide with lowest toxicity to pollinators	Minnesota Department of Agriculture, Water Quality Best Management Practices for Agricultural Use of Clothianidin and Imidacloprid. March 2023. Water Quality Best Management Practices for Agricultural Use of Clothianidin and Imidacloprid WRL Digital Asset Management (mnpals.net) , Best Management Practices for Vermont Golf Courses Best Management Practices for Vermont Golf Courses, second edition. 2022. vermont-bmps.pdf (gcsaa.org) , Turf & Ornamental Best Management Practices for Pollinator Protection, Walgenbach, J. North Carolina State University Extension Entomologist. Pollinator Protection in Apples. Pollinator-Protection-in-Apples_Walgenbach.pdf (pesticidestewardship.org) , Honey Bee Health Coalition, Best Management Practices (BMPs) to Protect Honey Bees and Other Pollinators in Soybean Fields. February 2020. HBHC_Soybean_022020.pdf (honeybeehealthcoalition.org) , Honey Bee Health Coalition, Apple Best Management Practices. USApple-Pollinator-BMPs-Final.pdf (honeybeehealthcoalition.org)
Pollinator Protection	Avoid applications during unusually low temperatures or when dew is forecast	Best Management Practices for Vermont Golf Courses Best Management Practices for Vermont Golf Courses, second edition. 2022. vermont-bmps.pdf (gcsaa.org)
Pollinator Protection	Leave a buffer strip of 2-3 feet between treated turf and the border of any landscape bed. This will minimize the potential for flowering ornamental roots to take up neonicotinoid insecticides	Purdue University Extension, Protection Pollinators in Home Lawns and Landscapes. 2016. Tips for Protecting Pollinators in Home Lawns and Landscapes (purdue.edu)