

## Living Sound Abatement — Firing Range

### Executive Summary

Vegetation provides modest but measurable noise reduction. Typical belts of 30–60 ft dense vegetation achieve ~3–5 dB; 200 ft of dense evergreen shelterbelt can approach ~10 dB. If land is limited, reductions are closer to ~1–3 dB. Costs vary significantly depending on width, stock size, and irrigation.

### Option Comparison

Option	Width	Expected dB Reduction	Installed Cost (per lf)	Annual O&M (per lf)
Ornamental Hedge	10–20 ft	~1–3 dB	\$20–\$150	\$2–\$8
Mixed Evergreen Belt	30–60 ft	~3–5 dB	\$35–\$100	\$3–\$10
Full Shelterbelt	100–200 ft	~5–10 dB	\$50–\$150+	\$4–\$12

### Design Principles

- Width & density drive results: multiple rows of evergreens with low branching.
- Continuity: no gaps at ground level.
- Expectations: Vegetation alone rarely credited by DOTs beyond 5 dB unless very wide.

### Recommendation

Pursue a 100–200 ft dense evergreen shelterbelt targeting ~5–10 dB. If constrained to 30–60 ft, expect ~3–5 dB. If only 10–20 ft is possible, plant dense hedges for ~1–3 dB and visual relief, paired with operational mitigations as needed.

A **shelterbelt** is a multi-row planting of trees and shrubs designed to act as a barrier against wind, noise, or visual impacts. For sound abatement, the focus is on **dense, evergreen species** arranged to maximize opacity year-round.

### Key Characteristics

- **Width:**
  - Effective noise abatement requires **100–200 ft (30–60 m) total width**.
  - Anything narrower typically provides more visual screening than measurable sound reduction.

- **Rows:**
  - **5 or more staggered rows** of trees and shrubs.
  - Tall conifers (e.g., pine, spruce, cedar) in middle rows.
  - Dense evergreen shrubs and small trees on edges to seal gaps at ground level.
- **Density:**
  - Trees are planted close enough so branches and foliage **interlock as they mature**, creating a continuous “green wall.”
  - **Evergreen dominance** ensures year-round blockage (deciduous trees lose leaves and let noise pass in winter).
- **Height:**
  - 20–50 ft or more at maturity (depending on species and spacing).
  - Lower shrubs (6–15 ft) fill in at ground level.
- **Continuity:**
  - The belt must be **gap-free at ground**—driveways, drainage breaks, or thinning trees undermine its effectiveness.

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## Performance

- **Expected Noise Reduction:**
  - **~5 dB** at **~100 ft width**.
  - **~10 dB** possible at **~200 ft width** when very dense and continuous.
  - Below **~50 ft width**, benefits drop closer to **1–3 dB**.
- **Additional Benefits:**
  - Visual screen hides the range.
  - Dust and wind reduction.
  - Wildlife habitat and community acceptance.