XII. ASSESSING THREATS TO BAT SPECIES: THE COLORADO BAT MATRIX

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While revising the Colorado Bat Conservation Plan, the Colorado Bat Working Group (CBWG) identified the need for a stand-alone, readily-accessible, reference document that identified and ranked potential threats (e.g., timber harvest, urbanization, energy development) facing Colorado bat species. Previous efforts to rank species status were problematic as many of the scores were vulnerable to personal bias and were changed when ranking outcomes resulted in values that bat experts did not feel were reflective of the threats facing a given species, or when the degree of the threat was compared between species. The Colorado Bat Matrix is the result of collaboration between CBWG members from universities, the private sector, and state and federal agencies, and is housed on the CBWG website for ease of access and revision (http://www.cnhp.colostate.edu/batmatrix/).

The primary audience for the Matrix is biologists and land managers who can use the rankings as a starting point for identifying threats to bat species. Researchers may also find the Matrix useful to identify gaps in knowledge for future study. We ranked the scope, severity, and immediacy of potential threats as high, moderate, low, or insignificant for 18 species of bats found in Colorado following methodology similar to NatureServe threat rankings (Masters et al. 2012). This ranking process avoids the pitfalls of personal bias and comparison of species, and, instead, focuses on the impacts of each threat to a given species with consideration given to the population.

CBWG DEFINITIONS

SCOPE

The proportion of the bat's population that is observed, inferred, or suspected to be directly or indirectly affected by the threat within Colorado. Because specific information on a species' statewide population is often lacking, the range of the species within Colorado is used.

Domain values for Scope of Threat are:
High = > 60% of total population
Moderate = 20-60% of total population
Low = 5-20% of total population
Insignificant = < 5% of total population

SEVERITY

How badly and irreversibly the impacted population may be directly or indirectly affected by the threat within Colorado. Severity is evaluated at the level the threat (regional/local).

Domain values for Severity of Threat are:
High = Loss of population (all individuals) or destruction of habitat in area affected, with effects essentially irreversible or requiring long-term recovery (>50 years) of the affected population.
Moderate = Major reduction of population or long-term degradation or reduction of habitat in area affected, requiring 20-50 years for recovery
Low = Low but nontrivial reduction of population or reversible degradation or reduction of habitat in area affected, with recovery expected in 5-20 years
Insignificant = Essentially no reduction of population or degradation of habitat, due to threats, with ability to recover quickly (within 5 years) from minor temporary loss

IMMEDIACY

Imminence of the threat to the species (i.e., how likely the threat is and how soon it is expected to be realized) within Colorado.

| Domain values for Immediacy of Threat are: |
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| **High** = Threat is operational (happening now) or imminent (within a year) |
| **Moderate** = Threat is likely to be operational within 2-5 years |
| **Low** = Threat is likely to be operational within 5-20 years |
| **Insignificant** = Threat not likely to be operational within 20 years |

FINAL VALUE

These rankings were condensed into a value ranging from "A," substantial, imminent threat, to "H," unthreatened. To illustrate the Matrix results, rankings for the Townsend's big-eared bat (*Corynorhinus townsendii*), a sensitive species for the USDA Forest Service and Bureau of Land Management in Colorado and a Tier 1 species of special concern as designated by Colorado Parks and Wildlife in the Colorado state wildlife action plan (2015), are shown in Figure 12.1. In Colorado, the greatest potential threats to this species are abandoned mine lands closure programs and renewed uranium mining with rankings of A (substantial, imminent threat) and B (moderate and imminent threat) respectively. Conversely, grazing and fuels treatments are unlikely to significantly affect Townsend's big-eared bat populations and given a rank of H or unthreatened. Determination of domain values for bat populations

can be difficult given the absence of good data for most bat species. Consequently, this tool has provided rankings for biologists and land managers made by local bat experts in lieu of better population data.

	A =	Substantial, imminent threat
	B =	Moderate and imminent threat
	C =	Substantial, non-imminent threat
	D =	Moderate, non-imminent threat
	E =	Localized substantial threat
	F =	Widespread, low-severity threat
	G =	Slightly threatened
	H =	Unthreatened
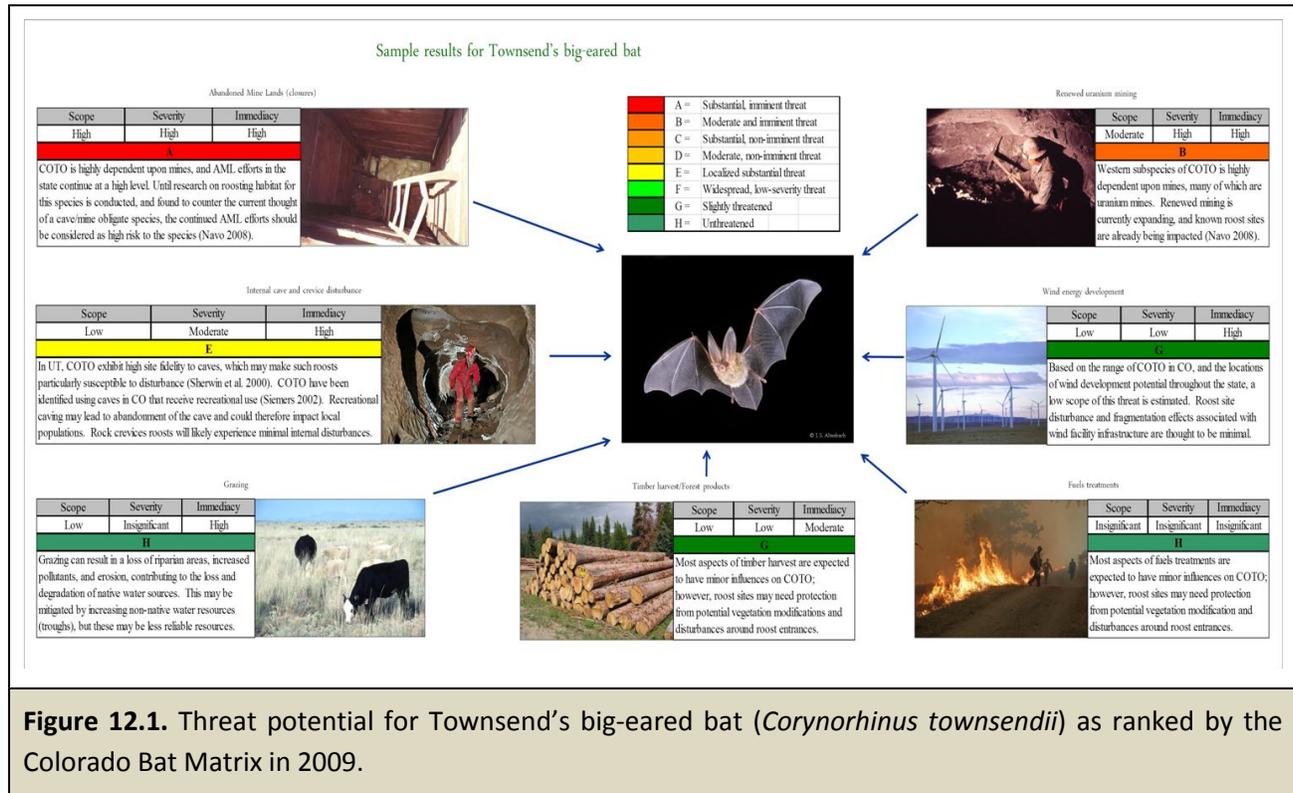
Figure 12.1. Threat potential for Townsend's big-eared bat (*Corynorhinus townsendii*) as ranked by the Colorado Bat Matrix in 2009.

The Colorado Bat Matrix serves as a model to rapidly identify threats to bat populations. This tool may assist biologists and land managers in determining which species or threats to focus limited resources. The Colorado Bat Matrix is a living document that will improve as gaps in bat populations and natural history are addressed. To access the Colorado Bat Matrix to explore threats to bat species of Colorado or to download a spreadsheet with full ranking descriptions/justifications along with associated literature, visit the CBWG website at http://www.cnhp.colostate.edu/batmatrix/methods.aspx.

LITERATURE CITED

CPW (Colorado Parks and Wildlife). 2015. Colorado state wildlife action plan: A strategy for conserving wildlife in Colorado. Denver, CO, 865 p.

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