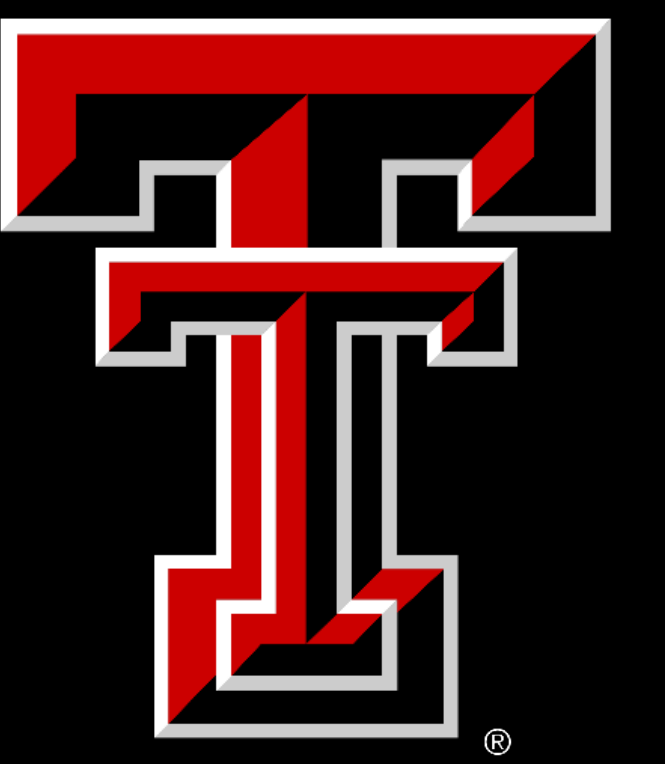


# Biodiversity Targets in Agricultural Grasslands: Specialized Rophitine Bees and Bristly *Nama*



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## Background

Agricultural landscapes can harbor high insect biodiversity including specialized fauna. The high diversity of native bees in grasslands suggests that some species could serve as biological targets for farmland conservation.

In the Southern High Plains and southwestern US, we are investigating native specialized, ground-nesting bees and their host plants in agricultural grasslands. Several native sweat bees are known as “*Nama*-specialists” and are distributed from southwestern Oklahoma to southern California and northern Mexico (Fig. 1). However, these specialized bees often go undetected using conventional sampling approaches, so less is known of this group compared to more common species.

Studies are being conducted to understand occurrences of this fauna in relation to climate and ecological factors and farming conservation practices. This specialized bee-plant system could serve as a biological target; our work aims to explore this application through understanding the biology and ecology of specialization among affected landscapes. Findings will provide the background information necessary to determine the efficacy of this native specialized system for biodiversity monitoring in farm conservation programs.



**Figure 2.** Clockwise from top left: *Nama hispidum* plant occurring at the Quaker Avenue Research Farm at Texas Tech University in Lubbock, Texas in relation to the more common *Gaillardia* (i.e. firewheel); two female *Sphecodosoma pratti* foraging in *Nama* flowers; soil nest entrance/exit hole of *S. pratti* below a *Nama* plant; male *S. pratti*; female *S. pratti*.

## Specialized Native Bee-Plant System

Approximately 4,000 species of native bees occur in North America, with over 75% of these nesting in soil habitats. Approximately 25% of these species are considered pollen specialists, requiring narrow ranges of host plants.

*Nama* L. is a genus of plants in the family Boraginaceae and is a host to specialized native bees belonging to the Rophitinae subfamily of sweat bees (Halictidae). Native bee species within two rophitine genera, *Sphecodosoma* Crawford, 1907 (Fig. 2) and *Conanthalictus* Cockerell, 1901, specialize on the plant genus *Nama* (Fig. 2) and are likely key pollinators of *Nama* (Tyrl et al. 1984). This specialized native system is currently being investigated by our lab to determine germination requirements and bee morphologies supported by DNA-barcoding. Resolving the taxonomy of specialized bees occurring in *Nama* is an important research need to support further studies of their ecology, threats, and efficacy for bioindication (Longing and Kelly, in review) in agricultural grasslands, emphasized by the potential for “likely undescribed species” [of both genera] occurring in western Texas (Michener 2000). Basic information on the biology and ecological requirements of this fauna underpins potential applications in farmlands involving native species conservation.

### Literature Cited:

Longing, S. and B. Kelly. *In review*. Developing and implementing plans to conserve insect biodiversity in agricultural landscapes. *In* Protecting natural capital and biodiversity in the agri-food sector (ed. Prof. Jill Atkins). Burleigh Dodds Science Publishing, Cambridge UK.

Michener, C. 2000. *Bees of The World*, 2<sup>nd</sup> Ed. John Hopkins University Press, 992pp.

Tyrl RJ, Erteeb FB, Bruner JT, Ezell WL, Estes JR, Grummer B. 1984. A biosystematics study of the relationship of *Nama hispidum* and *Nama stevensi* (Hydrophyllaceae). *The Southwestern Naturalist* 29, 367–375. <https://www.jstor.org/stable/3670988>

## Conservation Implications

This specialized bee-plant system could potentially serve as a monitoring tool for conservation in agricultural grasslands in the southwestern United States. However, unknown population conditions and uncommon occurrences in bee community datasets sampled conventionally hinder such applications. Most importantly, an incomplete understanding of this system could place this unique biodiversity at risk to localized extirpations from anthropogenic disturbances, drought and other factors.

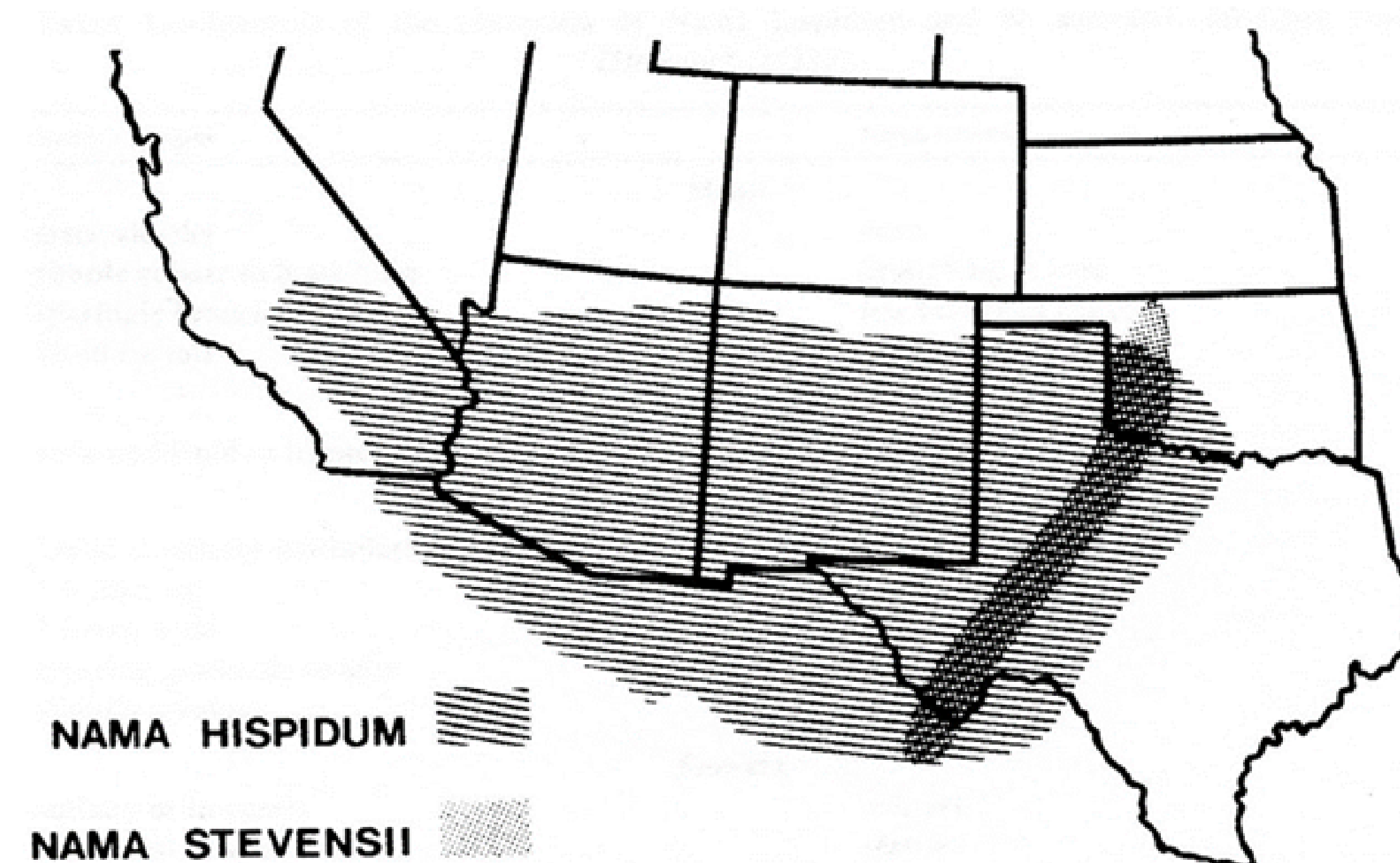
## Research Needs

Further studies of this specialized bee-plant system are needed to determine:

1. Germination requirements and ecological filtering of *Nama* sp. seeds among fragmented agricultural grasslands
2. Specialized rophitine bee taxonomy occurring on *Nama*, with a focus on potential new species as suggested by Michener (2000)
3. Environmental relationships and genetic population structures of *Sphecodosoma pratti* and *Nama* across fragmented landscapes, to inform ecological restoration and conservation monitoring on farms
4. Efficacy of specialized bees as bioindicators in agricultural grasslands

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**Figure 1.** Distribution of *Nama hispidum* and *N. stevensi* in the southwestern U.S. (from Tyrl 1984)