

1 **Do Birds Look Like Rain? Biotic and anthropogenic factors override abiotic factors in**
2 **determining feather δD values in a migratory bird species, White-winged Dove (*Zenaida***
3 ***asiatica*)**
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47 **Summary**

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49 1. White-winged doves (*Zenaida asiatica*) are a unique migratory bird species that serve an
50 important ecological role as a diurnal pollinator of the iconic saguaro cacti in the Sonoran desert
51 of southern Arizona and an economic role as highly sought after game bird species in North
52 America. White-winged doves are intimately linked to anthropogenic changes on the landscape
53 and because of this have experienced dramatic increases and declines in population numbers
54 over the last 60-70 years. It is unclear whether these fluctuations are due solely to factors
55 affecting them on the breeding or the wintering grounds.

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57 2. As a first step to link breeding and wintering locations for this species, we used isotopes of
58 hydrogen (δD) and carbon ($\delta^{13}C$) in feather tissue to 1) differentiate among populations of
59 white-winged doves across their breeding range in the United States and 2) investigate the
60 relationship between maps of North American precipitation δD commonly used to link breeding
61 and wintering populations of migratory birds.

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63 3. δD and $\delta^{13}C$ not only differentiated between the populations of white-winged doves that
64 breed in the United States, but also differentiated between doves that breed in agricultural
65 habitats from doves that breed in native desert habitats in Arizona.

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67 4. A weak relationship was found between δD of feather tissue and δD of precipitation for the
68 eastern populations of white-winged doves. However, ecological influences from desert
69 resources and anthropogenic influences from irrigated agricultural crops appear to determine δD
70 of feather tissue in western white-winged dove populations and not δD of precipitation.

71 5. *Synthesis and applications.* This study highlights the importance of characterizing breeding
72 ground feather δD for bird species that breed in habitats that are influenced by anthropogenic
73 factors or habitats that do not rely on seasonal precipitation before proceeding with movement
74 studies.

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111 Key Words: *Carnegeia gigantea*, feathers, isotopes, migration, precipitation, white-winged dove,
112 $\delta^{13}C$, δD