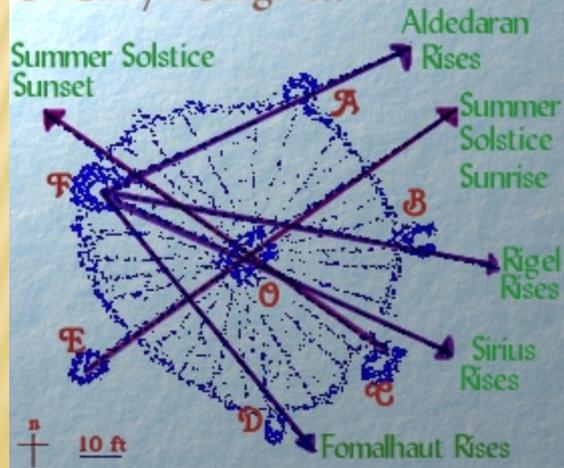


Traditional Ecological Knowledge in Adaptation Planning



Dr Eddy's Diagram



Margaret Hiza Redsteer

TRADITIONAL ECOLOGICAL KNOWLEDGE

Adaptive ecological knowledge developed through an intimate reciprocal relationship between a group of people and the “ecosystem” of a particular place, including all elements of the landscape and its natural hazards, over many generations.

“Ecosystem” is inclusive of all living beings including people, and also the land itself.

Different Knowledge Perspectives

	Western Science	Indigenous Knowledge
Approach	Compartmental Reductionist	Holistic, collective
How communicated	Written	Oral, demonstration
Learning Tools	Lectures, And books	Observations, Experience
Application Context	In Theory, “value free” but still a reflection of social priorities	Spiritual, social values – tied to place and cultural identity

TRADITIONAL KNOWLEDGE & CLIMATE CHANGE

- × **Traditional Place Names-**
 - + Describe conditions of an area
- × **Ceremonial Songs-**
 - + describe travel routes, important plants & animals
- × **Offering Sites-**
 - + resources such as springs, salt
- × **Traditional Medicines & Subsistence Foods**
 - + Changes in distribution, availability, viability of use
- × **Navigation-**
 - + seasonal wind patterns, river/coastal navigation
- × **Astronomical Observations-** constellations tied to animal migration times, harvests
- × **Traditional Seasons/Calendars**

CLIMATE CHANGE ADAPTATION APPLICATIONS OF TEK

- ✘ Can reveal detailed information about vulnerabilities
- ✘ Provide ecosystem-based measures that are better attuned to the nuances of local conditions
- ✘ Allows for societal and cultural values that may or may not be part of current adaptation policies
- ✘ Engage local communities- increasing equity in decision-making, creating local awareness about climate risks, and increasing adaptive capacity

CONDUCTED INTERVIEWS OF TRIBAL ELDERS: OBSERVATIONS FROM CEREMONIALISTS, BOTANISTS, & KNOWLEDGE KEEPERS 105 INTERVIEWS BETWEEN 2002 & 2015



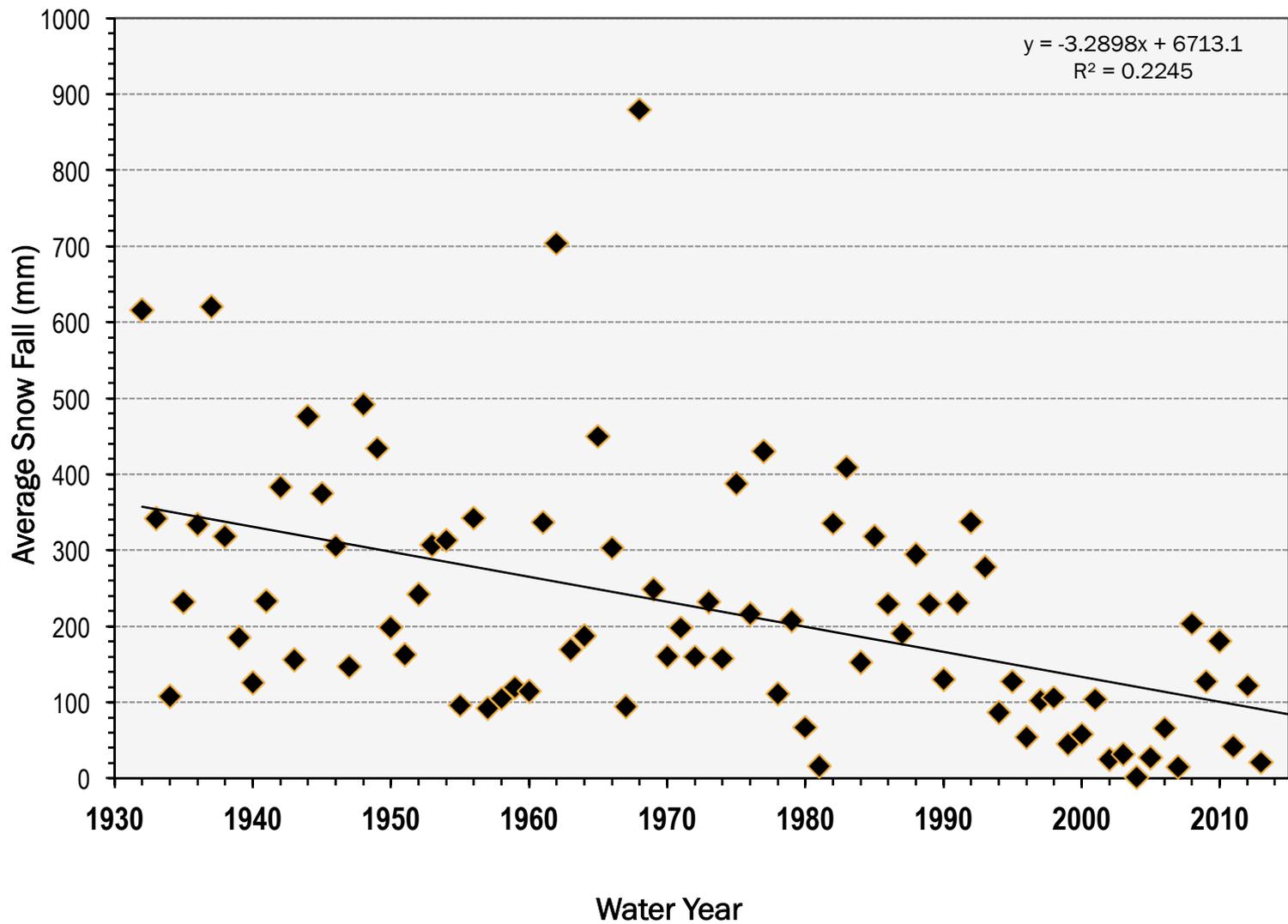
Discussions in Navajo Language
Observations consistent with
meteorological records

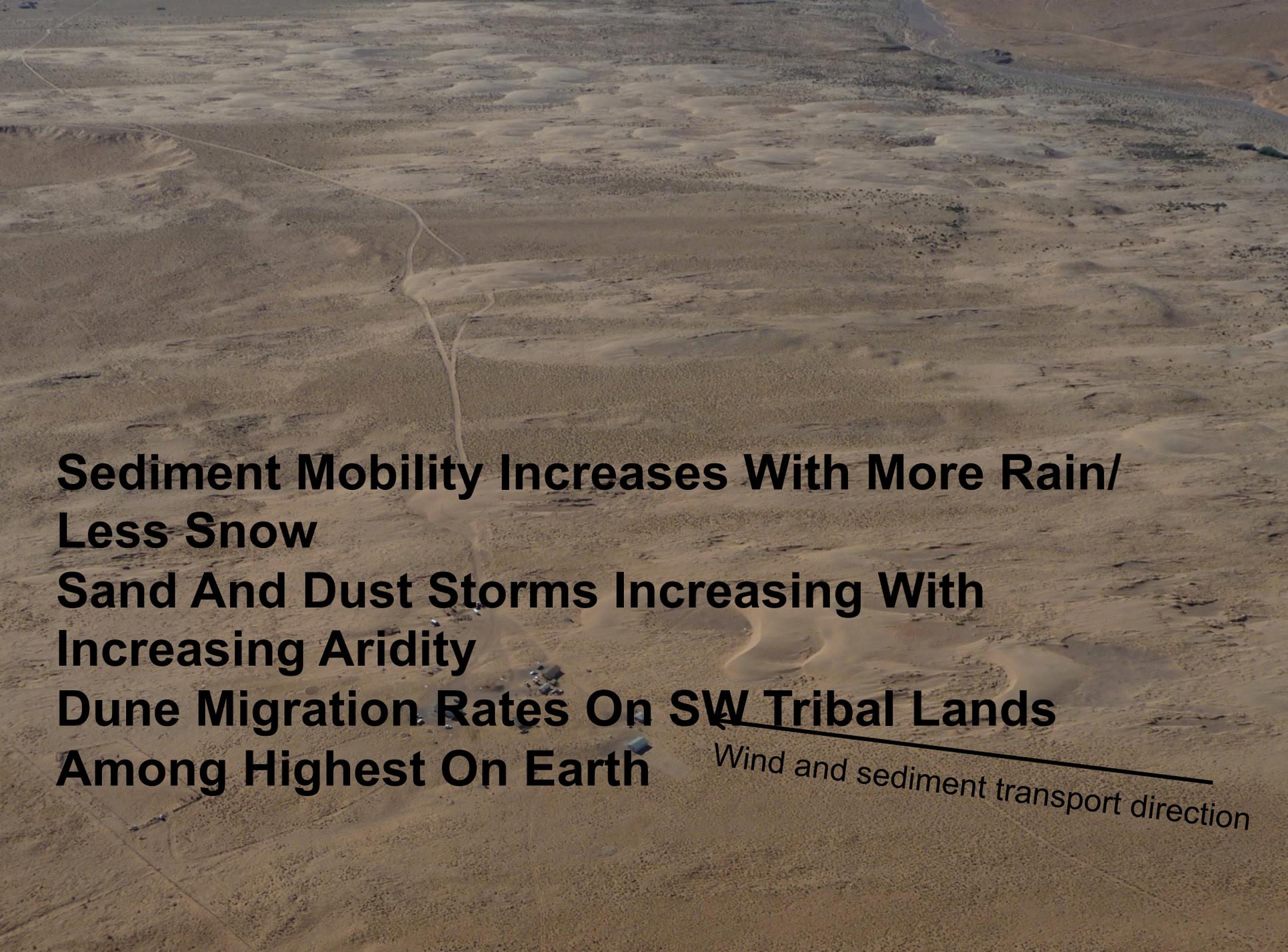
OBSERVATIONS FROM 105 ELDERS:

Changes in Weather

- Today less rain and snow (all)
- In late 1930s - 1940s climate began to shift from wet to dry (oldest)
- In the 1940s the snow was big every year, chest high on the horses.
- The climate has gotten drier since 1944
- Since the 1990s there is drought & heat
- More moving sand & dust starting in 1950' s
- In 1954, 1962 and 1999 there were strong wind storms
- In 1970s it began to get hotter and drier
- Now it' s hotter with more wind

TODAY THERE IS LESS SNOW



An aerial photograph of a vast, arid desert landscape. The terrain is characterized by numerous sand dunes of varying sizes and shapes, interspersed with flat, sandy areas. A prominent, light-colored dirt road or path winds through the dunes from the upper left towards the center. In the lower right, a small cluster of buildings and structures is visible, situated near a dune. The overall color palette is dominated by shades of tan, brown, and beige, with some darker patches of vegetation or rock. The lighting suggests a bright, sunny day, casting soft shadows that define the contours of the dunes.

**Sediment Mobility Increases With More Rain/
Less Snow**

**Sand And Dust Storms Increasing With
Increasing Aridity**

**Dune Migration Rates On SW Tribal Lands
Among Highest On Earth**

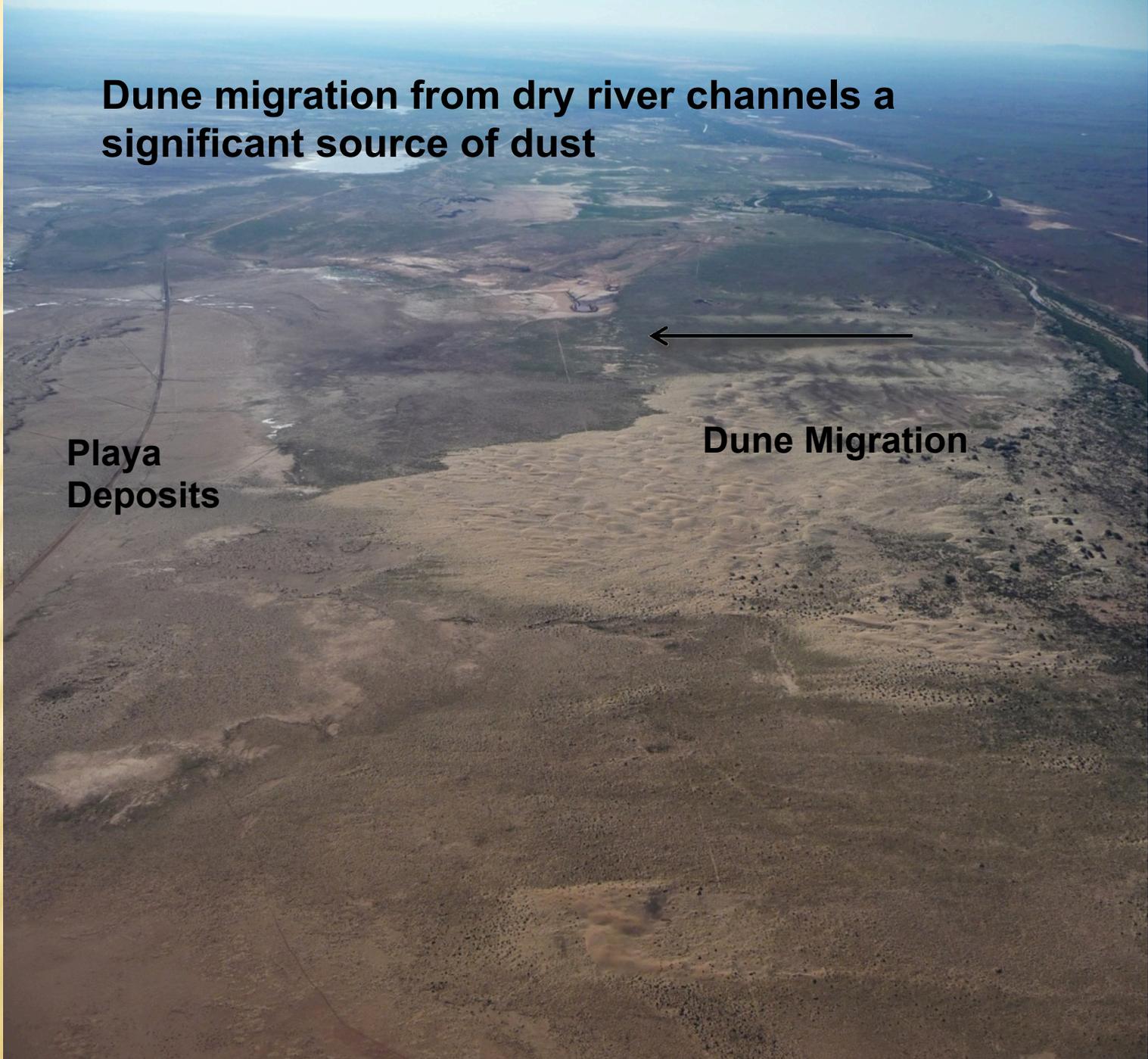
Wind and sediment transport direction

Dune migration from dry river channels a significant source of dust

**Playa
Deposits**



Dune Migration



DUST FROM NE ARIZONA

UT

CO

AZ

NM



Flagstaff, AZ



Based on current data and local observations

- Increasing temperature has already affected the ecosystems of NE AZ on the Navajo Nation
 - ***Declining water supplies and increased drought severity***
- Elder observations consistent with limited physical data sets
 - ***BUT ALSO provide additional information about ecosystem change***

OBSERVATIONS OF ENVIRONMENTAL CHANGE

- Before 1944, the ground stayed moist until July (Monsoon season)
- **Until late 1970s there was enough water and people planted crops**
- Springs and Lakes drying up (Offering Sites)
- **Rivers flowing less often**
- Disappearance of Beavers, Cranes, Herons, Egrets, Eagles, Lizards, Bees and Locusts
- **Disappearance of cottonwood trees, willows, ceremonial and medicinal plants**
- Ceremonialists traveling farther to cooler, wetter high elevations for medicines
- **New plants with no Navajo names**

Past Adaptation Strategies

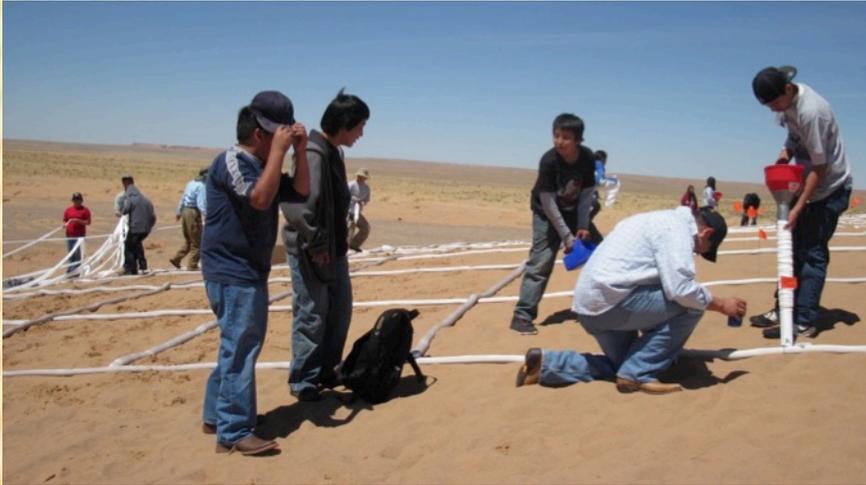
- **Movement of livestock within a broader region shared by extended families**
- **Kin-based sharing of resources,**
 - **movement away from drought affected areas**

These ways are discouraged by the current grazing and land use policies,

Now land and water disputes are common



MITIGATION OF SAND AND DUST STORMS



- ✘ Focus not only on dunes but also riparian corridors- wind shelter belts
- ✘ Will require more nuanced grazing policies- rotational grazing may need to be reconsidered
- ✘ Seasonality of windy season and phenology of native v. invasive plants
- ✘ Requires community engagement

Including Indigenous People (TK) In CC Studies

- How well are changes truly represented in models depends on scale and level of monitoring
- **What kinds of ecosystem changes are there that conventional measurements are not capturing or we're just not seeing?**
- Enhance our understanding vulnerabilities and the consequences of adaptation actions
- **TEK and Local knowledge another way to inform planning and engage communities in the adaptation process**