Utilizing Native and Invaded Grasslands as Indicators for the Ecological Health Assessment for the Nature Reserve of Orange County

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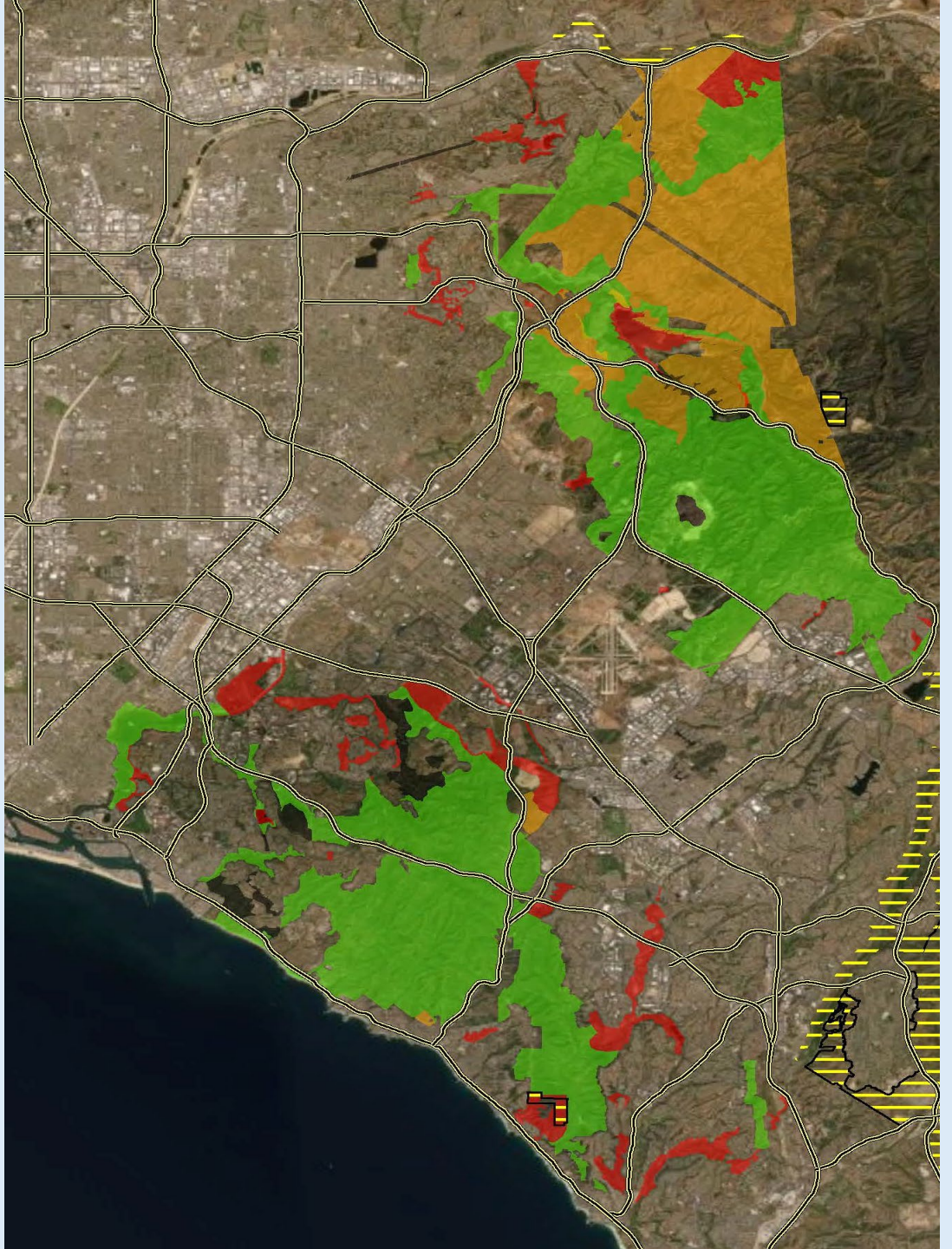
Orange County Study Area

- 38,000 acre Nature Reserve of Orange County, plus 11,000 acres of adjacent easement lands

- Total: 50,000 acres

- Valley and South Coastal grassland types in study area



Why Was Grassland Included as Indictor of Ecosystem Health?

- ~ 90% of species in CA's Inventory of Rare and Endangered Species can be found in grasslands
- Grassland specialist flora and fauna, carnivore habitat
- Threats to species diversity & ecological value remain
- Native grasslands represent one of the most comprehensive vegetation type conversions from native to non-native dominated

Distinguishing Non-native (Annual) and Native (Perennial) Dominated Grasslands

- Non-native grasslands: characterized by annual grasses, uniform structure, and are extensive
- Native grasslands: characterized by perennial bunchgrasses, structurally heterogeneous, exist as remnant patches
- Forbs- diverse in both grassland types as annual and perennial natives and non-natives
- The life history trait of being an annual or perennial both divides native and non-native grasses and can have different implications for management decisions (grazing intensity, dozer lines, fire regimes) and optimal environmental conditions (soil conditions, exposure)
- We therefore subdivided the grassland indicator into annual vs perennial grasslands

Defining Grassland Types

- Grasslands vs Shrubland:

<20% shrubs or tree cover

- Grassland (Ecotone):

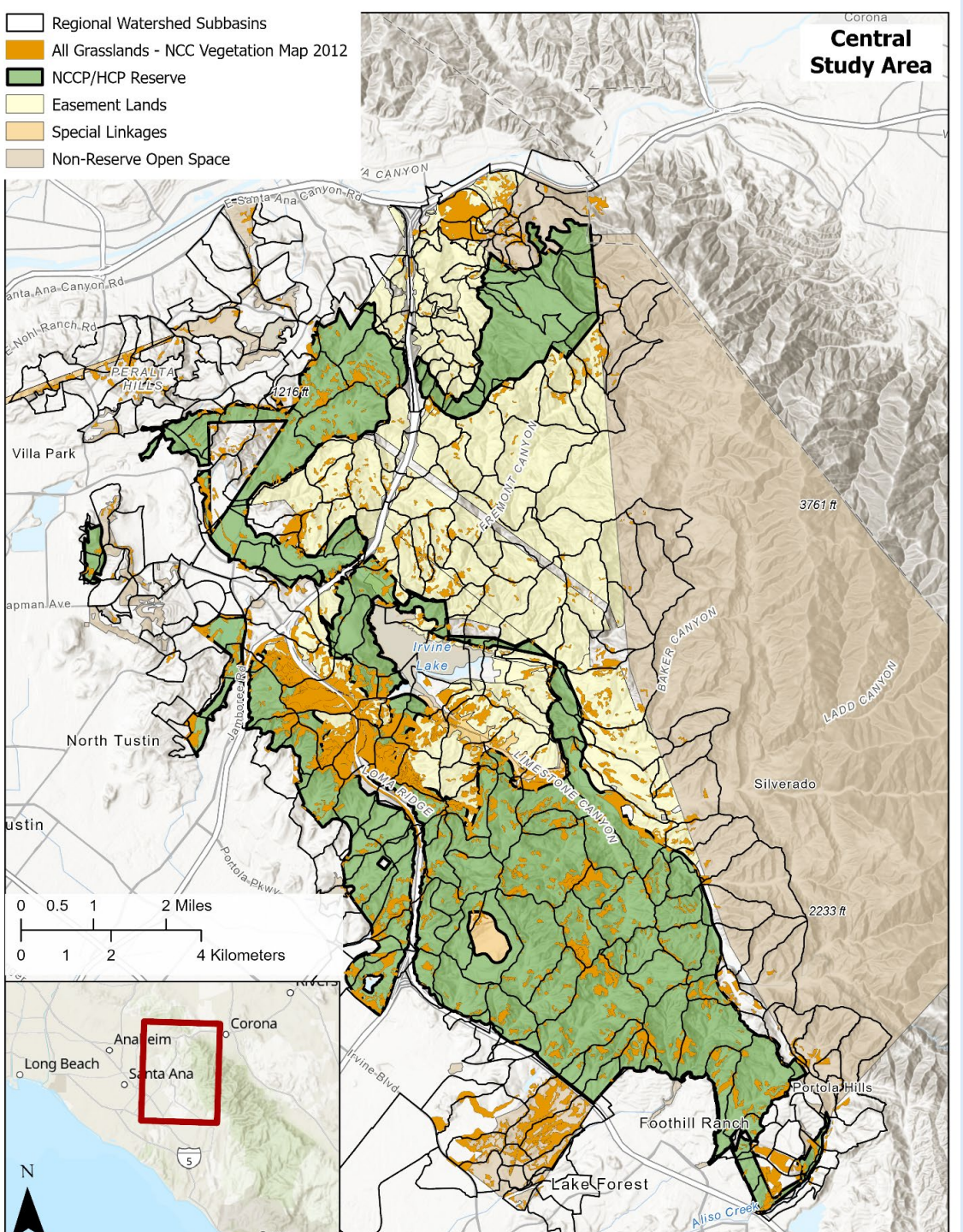
10% - 20% shrub or tree cover

- Perennial grasslands: >10% relative perennial native grass cover (structural dominant)

Challenge: Mapping Lumps Non-native (Annual dominated) and Native (Perennial dominated) Grasslands into One Type

This results in loss of the less common native perennial grassland subtype due to:

- Less specialized management
- Being overlooked during disturbances particularly destructive to perennials, such as: dozer lines, trampling, overgrazing



Framework of Ecological Health Assessment

CENTRAL STUDY AREA

Condition: Significant Concern

Trend: Declining

Confidence: Moderate

COASTAL STUDY AREA

Condition: Significant Concern

Trend: No Change

Confidence: Low

Perennial Grasslands

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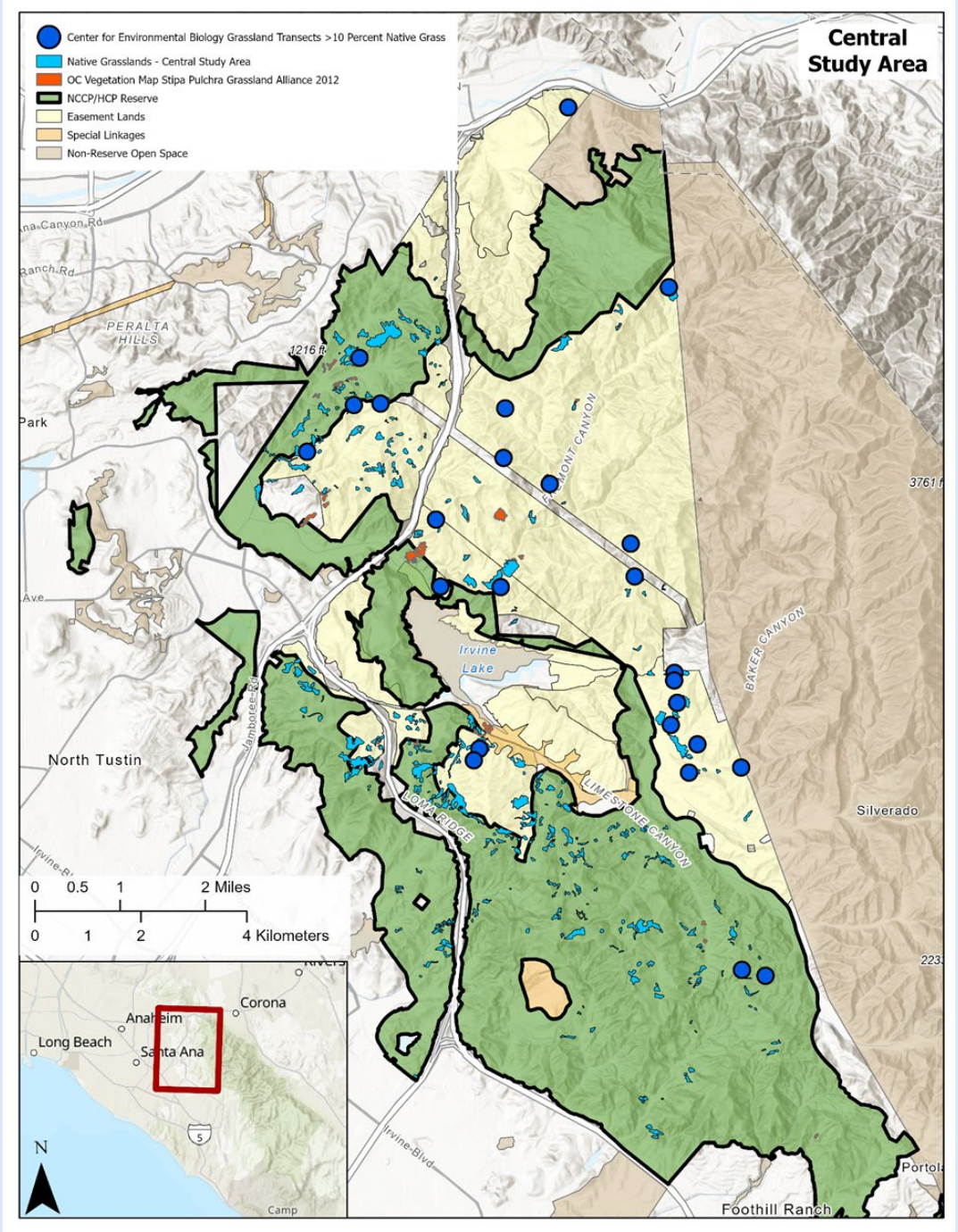
Annual Grasslands

Based on the combined average values of the individual metrics:

- Overall Condition
- Trend
- Confidence

Challenge of Establishing Baseline Conditions

- Denser populations of perennial grasslands are patchy across grasslands and generally not mapped
- Vegetation monitoring efforts across the NROC were designed to monitor grasslands as a single type and therefore likely to miss patches of denser perennials
- Seems to be typical across state



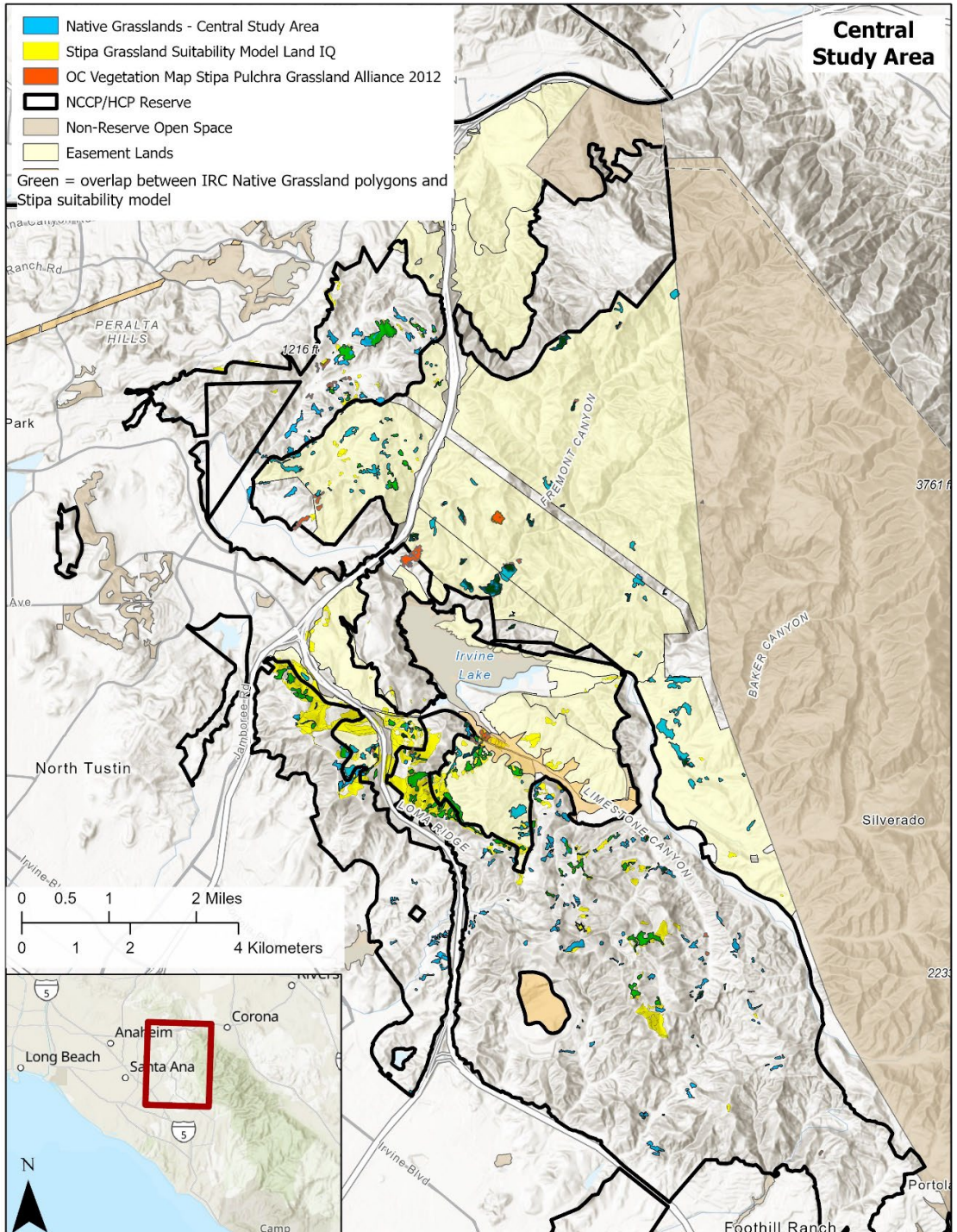
(TNC, 2003; IRC, 2008–2009); CEB/SDSU, 2007–2023)

Native Perennial Grassland Mapping and Habitat Suitability Model

- Because historic distribution of perennial grasslands is unknown, considered using polygons from a habitat suitability model as a baseline

- Decided to hold off until more populations mapped to “feed” the model better data characterizing desirable environmental conditions

- Also need a better map of environmental conditions, particularly soils and phosphorus



Desired Condition (both grassland types):

Large, native-rich grasslands that persist within a habitat mosaic and function to support grassland-dependent native flora and fauna.

Goals of Metrics:

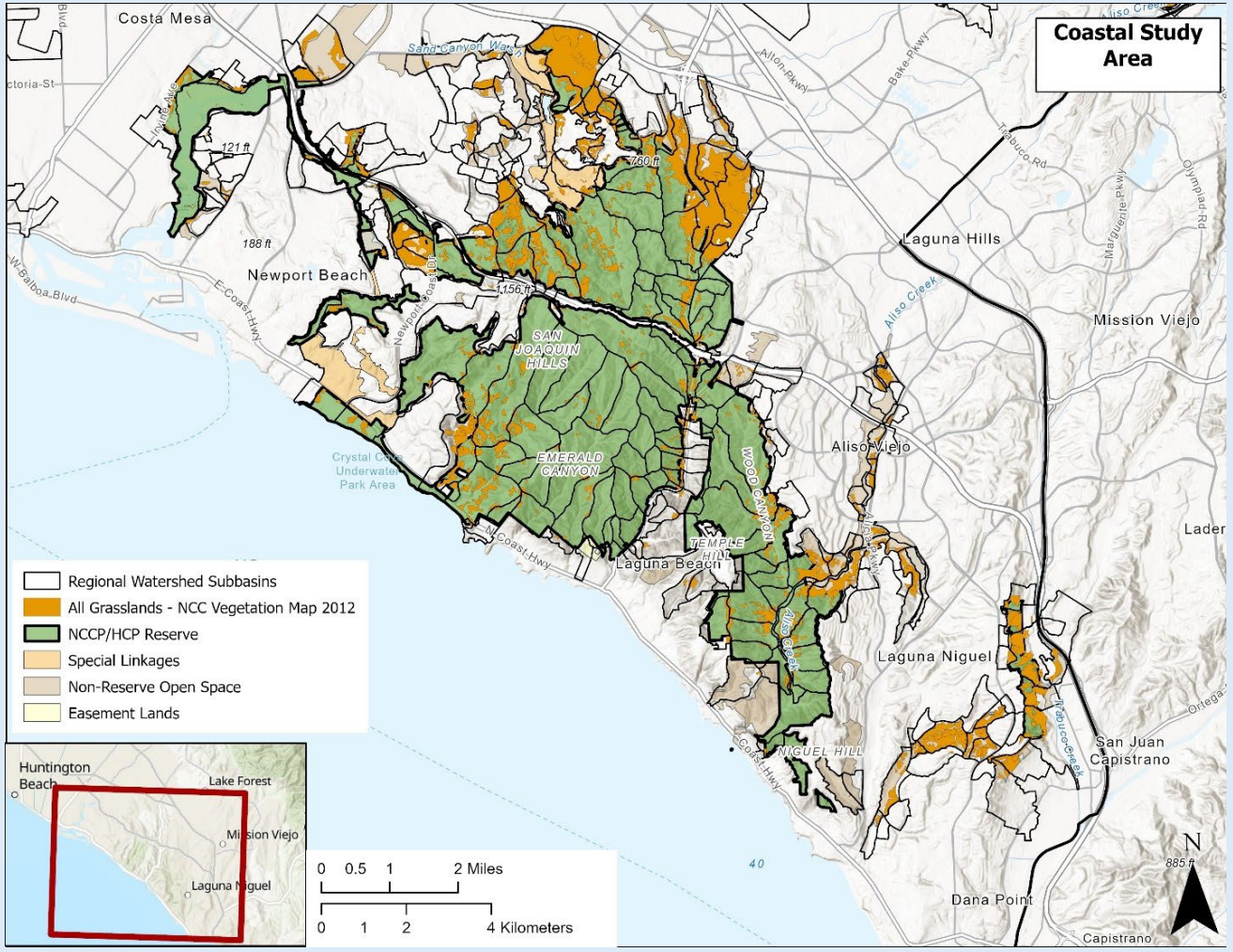
- Grasslands exist in blocks large enough to benefit grassland specialist species and are distributed throughout the Study Area
- Perennial grasslands occur in areas of suitable habitat in the Study Area and cover of *Stipa pulchra* sufficient to provide community structure
- Diversity and function of native forbs maintained (both grassland types)

Annual Grassland Metric 1: Proportion of grassland per sub-watershed area

Condition Goal: Maintain the mosaic cover of reference grasslands throughout the EHA Study Area.

Thresholds: Based on the proportion of grassland relative to the total area of a given sub-watershed:

- **Good:** is≥80% of baseline proportions.
- **Caution:** ≥50%–79% of baseline proportions.
- **Significant Concern:** <50% of baseline proportions.



Perennial Grassland Metric 1: Percent cover *Stipa pulchra*

Condition Goal: Native grasses occur at >20% cover in perennial grasslands.

Threshold cover levels:

- **Good:** >20%.
- **Caution:** 11%–20%.
- **Significant Concern:** <11%.

Metric 2 (both grassland types): Percent cover Native Forbs

Condition Goal: Mean native forb cover among annual and perennials occurs at >15% for at least one of every three years in most grasslands.

Threshold: Highest mean cover among transects is:

Good: >15% in at least one of three years, or for >70% of sampled polygons
Caution: 10%–15% in at least one of three years, or for >30% of sampled polygons
Significant Concern: <10% in at least one of every three years, or for >30% of sampled polygons

Metric 3 (both grassland types): Native Forb Richness

Condition Goal: Total native forb species richness is >8 species/100 sqm in at least one of three years.

Thresholds:

- **Good:** Highest native forb species richness is >8 species/100 sqm in at least one of three years.
- **Caution:** Highest native forb species richness is 4 to 8 species/100 sqm in at least one of three years.
- **Significant Concern:** Highest native forb species richness is <4 species/100 sqm in at least one of three years.

Metric 4: Residual Dry Matter

Annual Grassland:

Condition Goal: Managed before mid-spring to a level that both promotes forb diversity and germination and protects soil from erosion and compaction.

Thresholds: Fall RDM is:

Good: >400 pounds/acre and <600 pounds/acre

Caution: <399 pounds/acre and >1,000 pounds/acre

Significant Concern: <250 pounds/acre and >2,000 pounds/acre

Perennial Grassland:

Condition Goal: Manage early in the season to a level that provides perennial grass growth meristems with sufficient light but also protects plants from significant physical damage and soil from erosion and compaction.

Thresholds: Fall RDM is:

- **Good:** >576 pounds/acre and <1,500 pounds/acre
- **Caution:** <575 pounds/acre and >1,501 pounds/acre
- **Significant Concern:** <400 pounds/acre and >3,500 pounds/acre

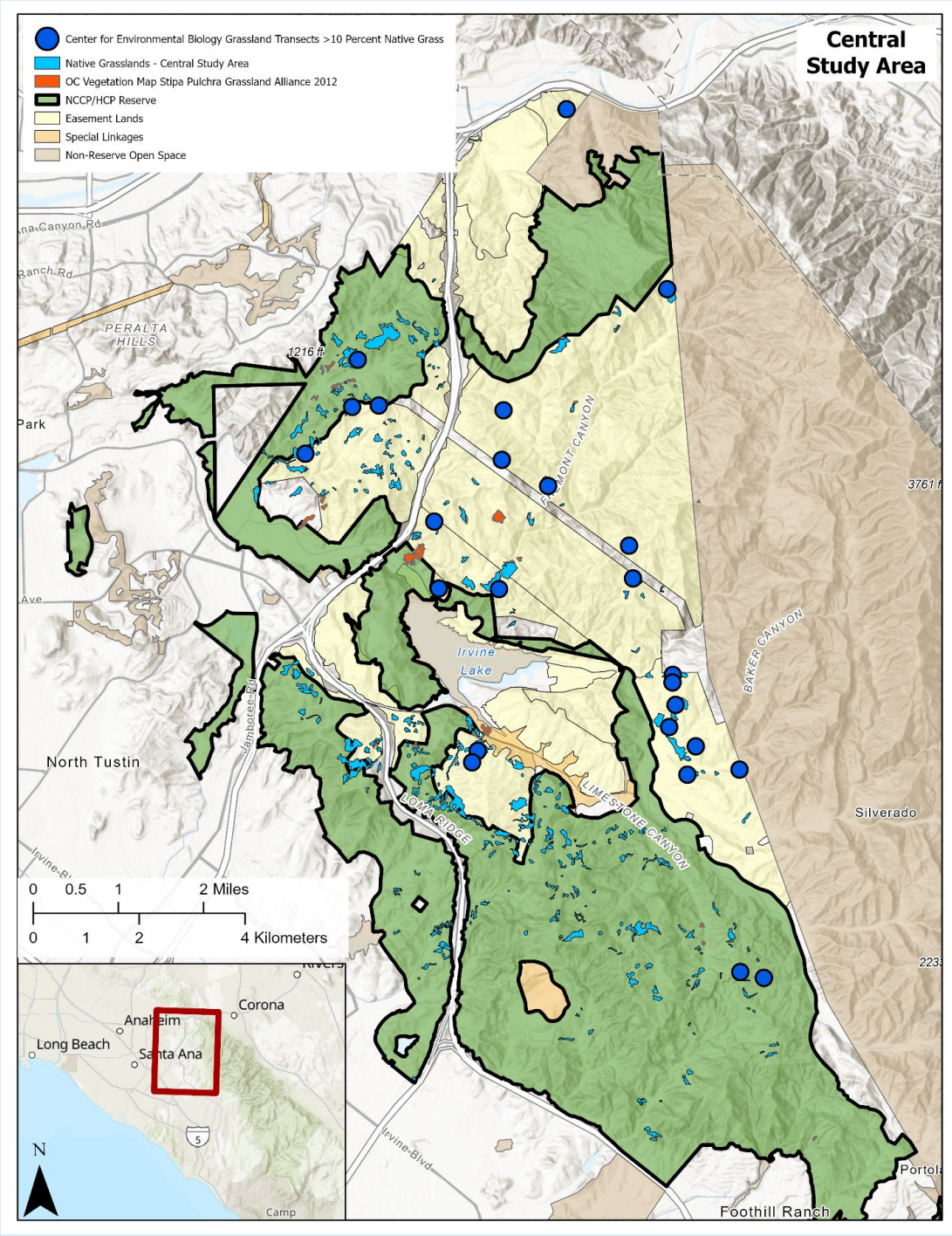
Gathering and Summarizing Datasets

- Challenging since no comprehensive datasets across space and over time to determine trends
- Reached out to different organizations involved in surveying and mapping over the decades
- Compiled different datasets and assigned confidence level for each metric
- In some cases, like residual dry matter, so little data developed metric and recommended starting data collection

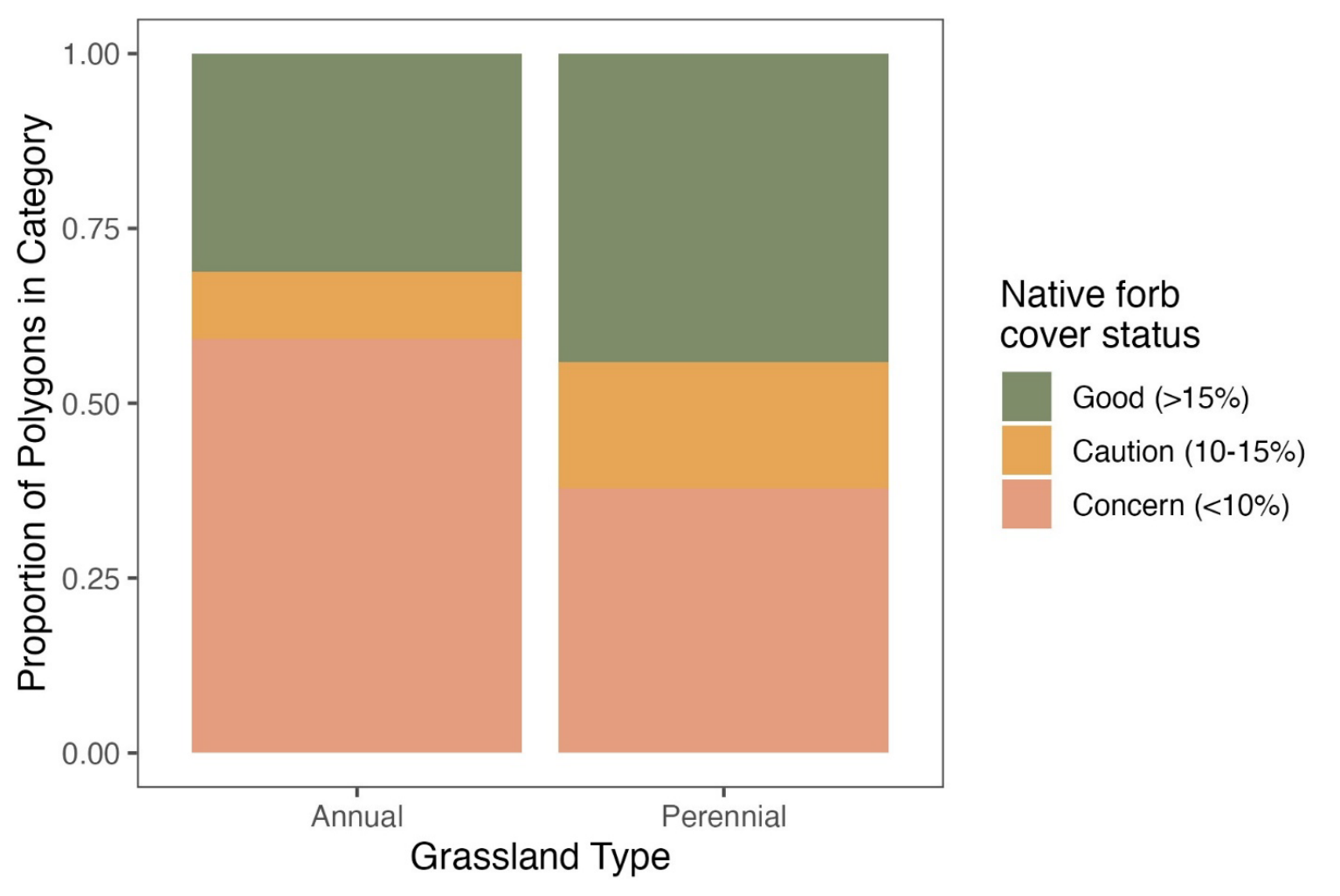
Native Grassland Mapping and Grassland Transect Data (Central Study Area)

Datasets differ spatially and temporally:

- The Nature Conservancy 2003
- Irvine Ranch Conservancy 2008–2009
- Center for Environmental Biology & San Diego State University 2007–2023

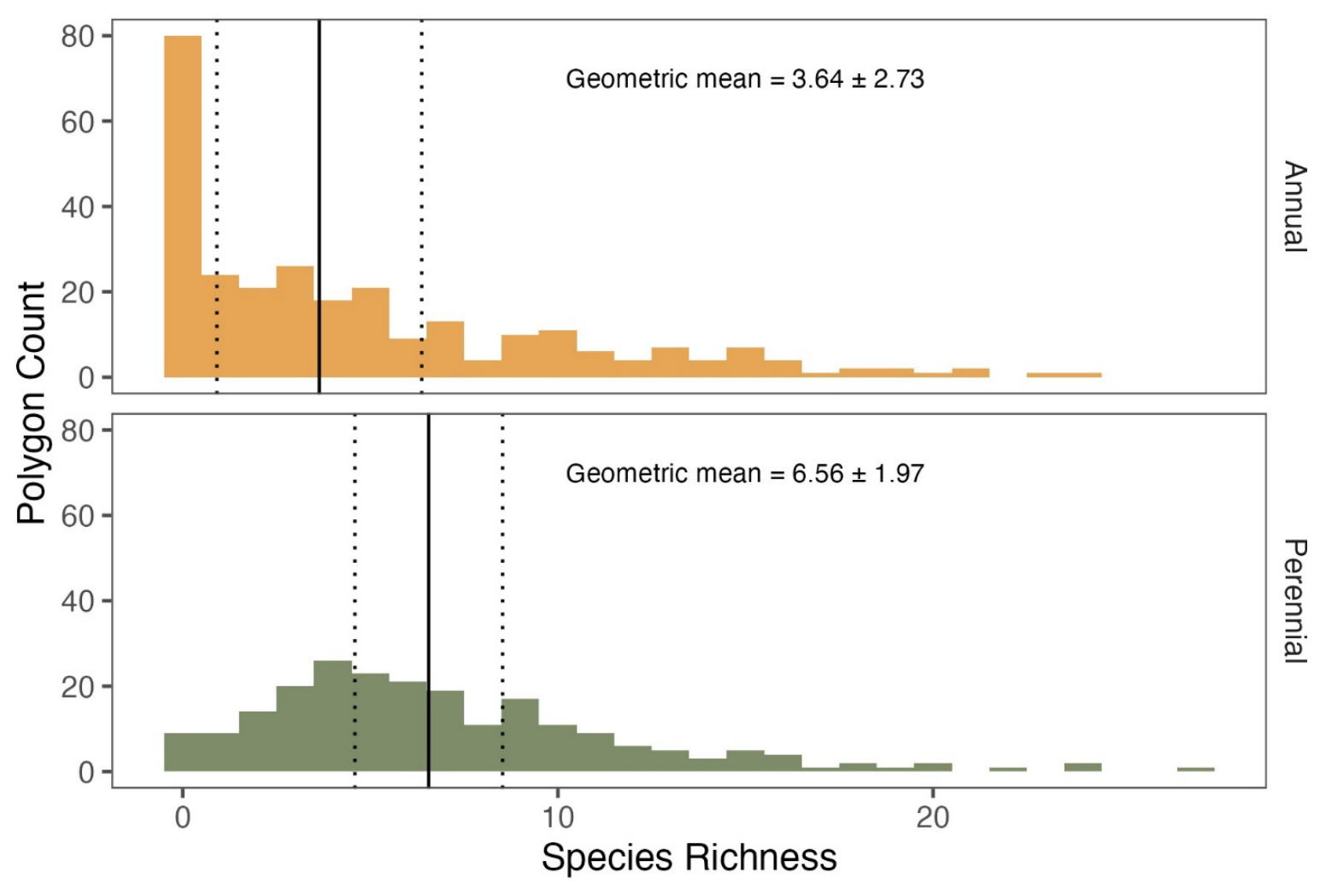


Native Forb Cover
Proportion of polygons in the Central Study Area



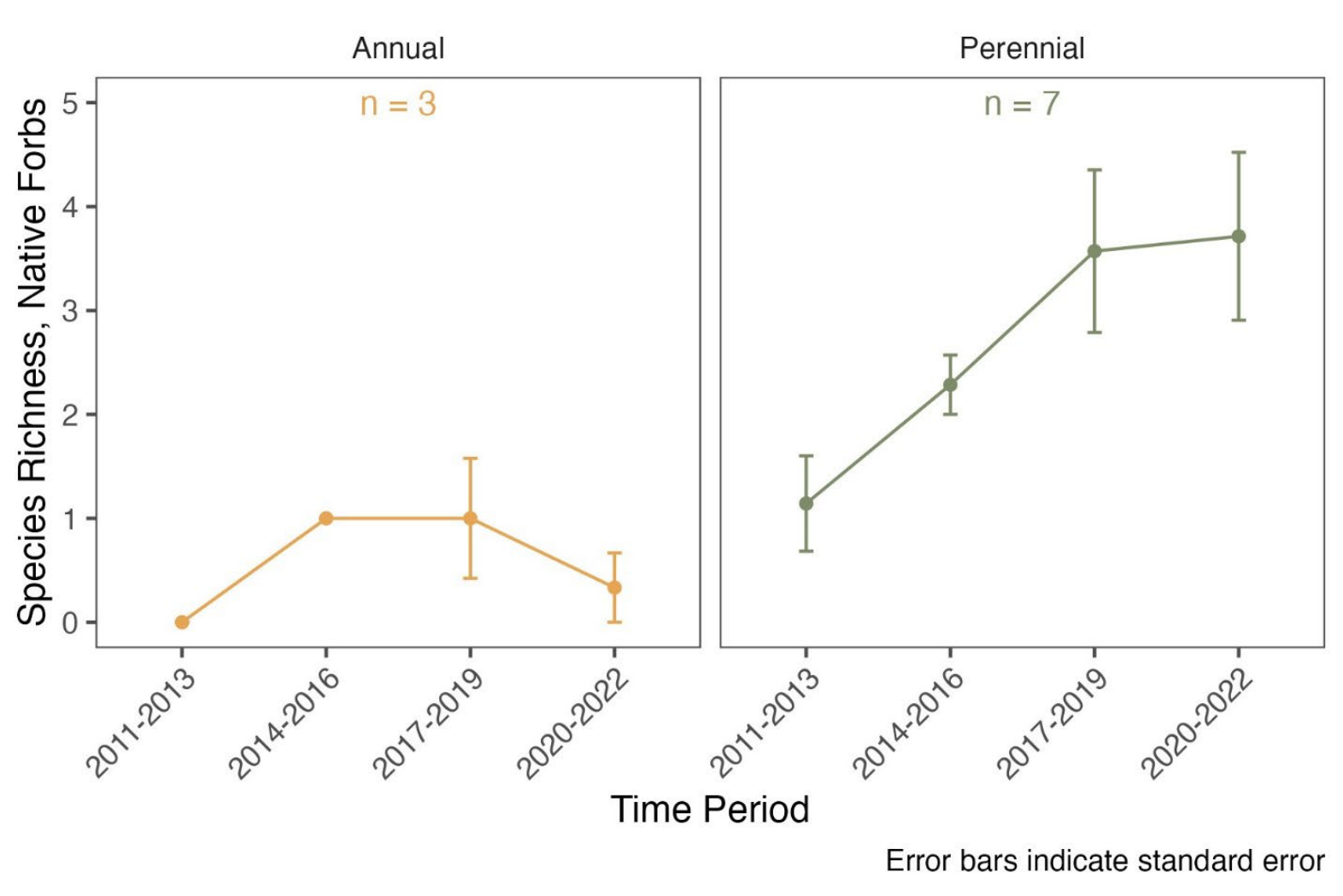
(IRC, 2008–2009)

Native forb species richness
Native Grassland polygon surveys in the Central Study Area



(IRC, 2008–2009; TNC, 2003)

Species Richness of Native forbs/100 sqm belt transect Maximum Value/3 year Period



(CEB/SDSU grassland transects)

Condition Summary: Average of Metrics

Perennial Grasslands

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Recommendations

- Mapping to level that distinguishes perennial and annual grasslands
- Add transects to track health of each grassland type across mapped polygons
- Update habitat suitability model for perennial grassland and create reference polygons for condition assessment
- Consider grazing or mowing in specific grassland areas tailored to favor the life history strategy of native species comprising that grassland type.
- Add measurement of residual dry matter (or correlate metric)

Acknowledgements

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