

Developing Indicators of Riparian Restoration Success for Yellow-billed Cuckoo for the South Fork Kern River, CA



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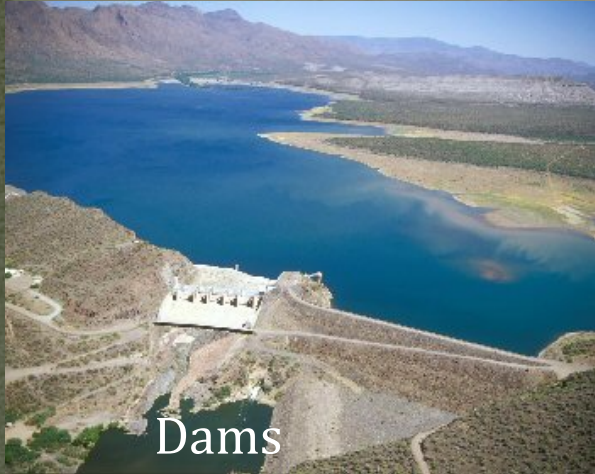
Species Protection



- Endangered in California - 1978
- Species of Special Concern in Arizona - 1988
- Western DPS Federally Threatened - 2014

Threats Challenging Recovery

#1: Habitat loss/ degradation due to water management



Western Yellow-billed Cuckoo Habitat

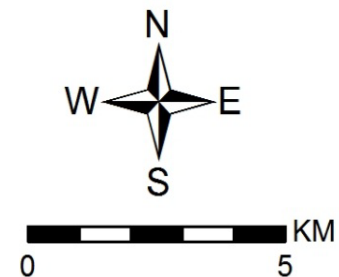
- Large riparian forests
- 16-20 ha – 40 football fields
- 1-3 ha young dense willow-cottonwood for nesting



Kern River Valley, CA Study Area

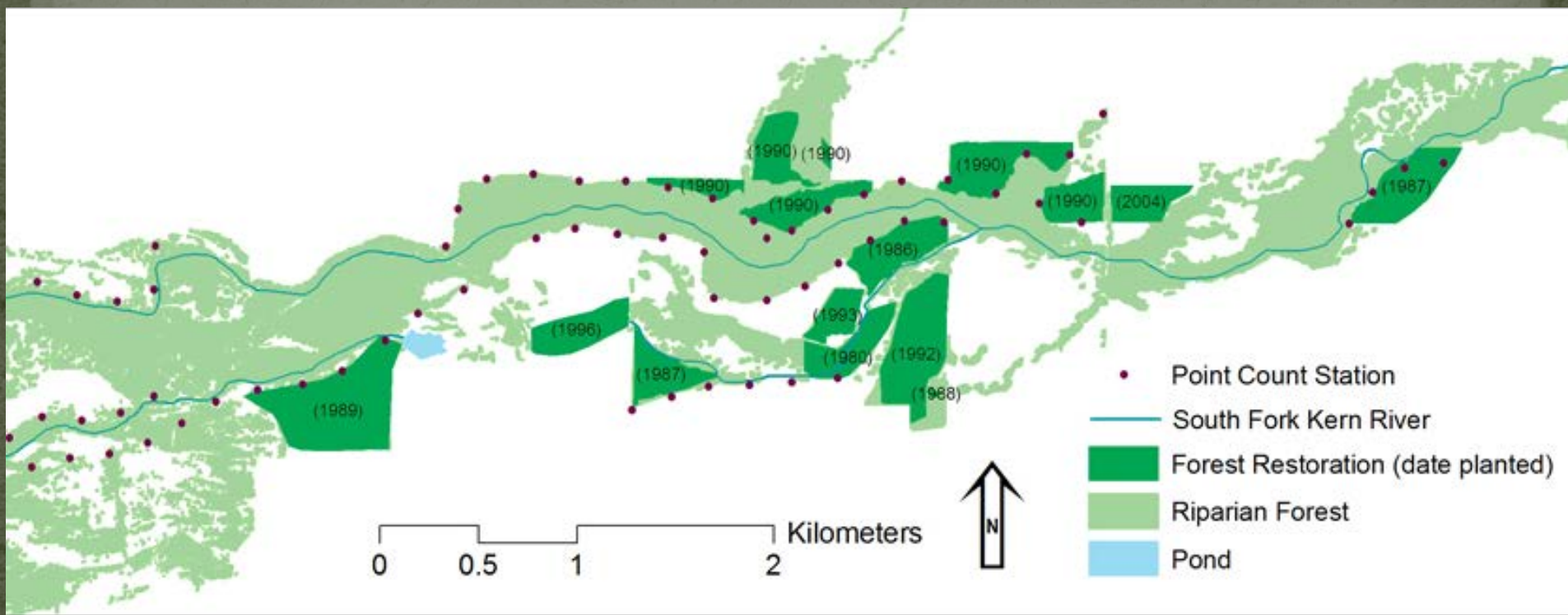


-  Kern River Preserve
-  South Fork Wildlife Area



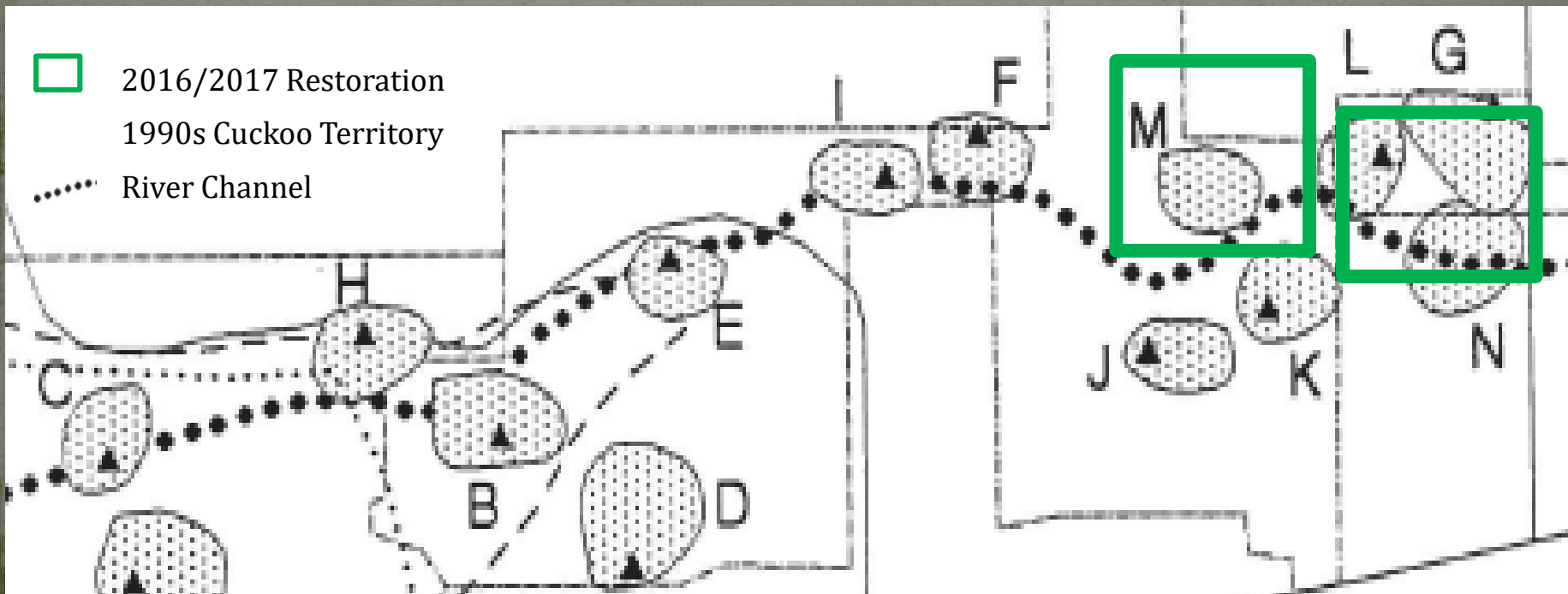
Historical Restoration in Kern River Valley

- 125 ha planted in 1980s and 1990s
- Adjacent to natural riparian forest
- 25 nesting pairs cuckoo in 1992
- 0-2 nesting pairs in last few years
- Population fluctuates



Restoration 2016 - 2018

- Clear dead down wood
- Flood irrigation
- Plant willow-cottonwood



Management Objectives

1. Develop Songbird and Vegetation Indicators
2. Evaluate Restoration Success



Methods

1. Find songbird community associated with cuckoo based on historical territory data – PCA

2. Relate historical songbird community to veg variables using PC with strong loadings on cuckoo – mixed effects models and model selection

3. Evaluate new restoration using new territory and veg data



Territory Data

Laymon 1989-1996

- Songbird territories/ ha
 - 16 (10-20 ha) sites
 - 11 Restoration sites (4-11 yrs old n = 41)
 - 6 Mixed-age sites (6-11 yrs old n = 18)
- 21 cuckoo territories

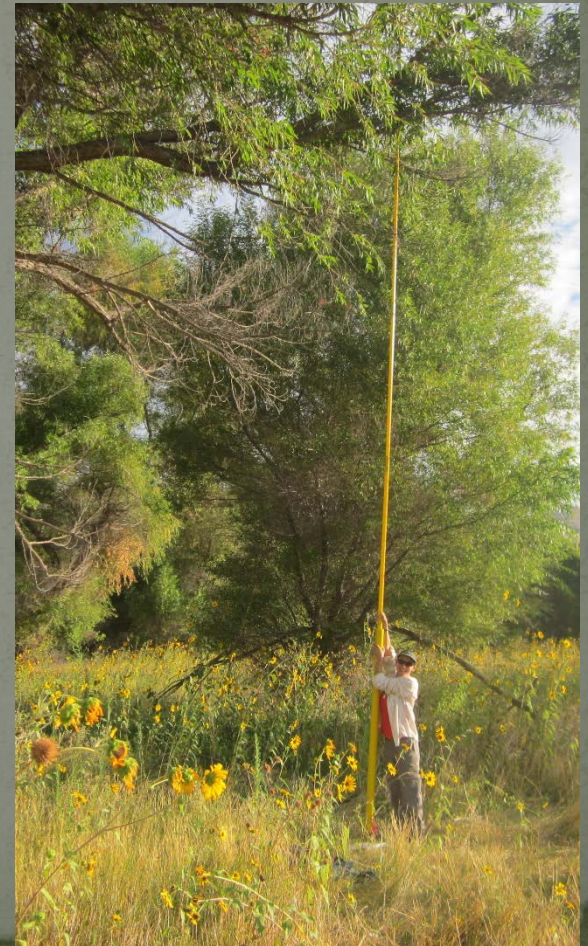
SSRS 2016 - 2017

- 7 ~5 ha historical Laymon sites 25-35 yrs old
 - lacking understory
- 0 cuckoo territories over 2 years



Vegetation Variables (Mean and SD)

- DBH
- Trees/ha
- %Grass
- Cottonwood/ha
- %Bare ground
- Willow/ha
- %Brush
- Vert Struct 0-1m
- Vert Struct 1-2m
- Vert Struct 2-3m
- Vert Struct 3-4m
- Vert Struct 4-5m
- Vert Struct 5-6m
- Vert Struct 6-7m
- Vert Struct 7-8m
- Vert Struct 8-9m
- Vert Struct 9-10m
- Vert Struct 10-11m
- Vert Struct 11-12m
- Vert Struct 12-13m
- Vert Struct 13-14m
- Vert Struct 14-15m



Results: Principle Components Analysis

Species	PC1	PC2	PC3
YBCU	0.30	0.12	-0.28
ANHU	0.11	-0.04	-0.44
YWAR	0.45	-0.19	0.11
COYE	0.006	-0.58	-0.34
YBCH	0.40	0.01	-0.14
SUTA	0.43	0.23	0.04
BLGR	-0.27	0.02	-0.53
LAZB	0.07	0.44	-0.51
SPTO	0.39	0.35	0.01
SOSP	0.37	-0.45	-0.16



- PC1 explains most variation in dataset
- Highest loading for YBCU

Species	Nest Height	Forage Height	Prey during Breeding
YBCU	1-13m	>3-11m	Large insect generalist; caterpillars, katydids, grasshoppers, crickets
YEWA	1-3m	5-10m	Lepidoptera larvae, beetles, true bugs, flies, and ants, termites
SUTA	4-11.3m	10-11.5m	Cicadas, wasps, spiders, beetles, grasshoppers and crickets, flies, and true bugs
SPTO	0.6-3.6m	Near ground	Beetles, true bugs, ants and termites, crickets, grasshoppers, caterpillars and moths, litter arthropods
SOSP	0-4m	Near ground	Small insects and invertebrates
YBCH	0.5-2	Near ground	Beetles, true bugs, ants, ants, sawflies and wasps, mayflies and various caterpillars



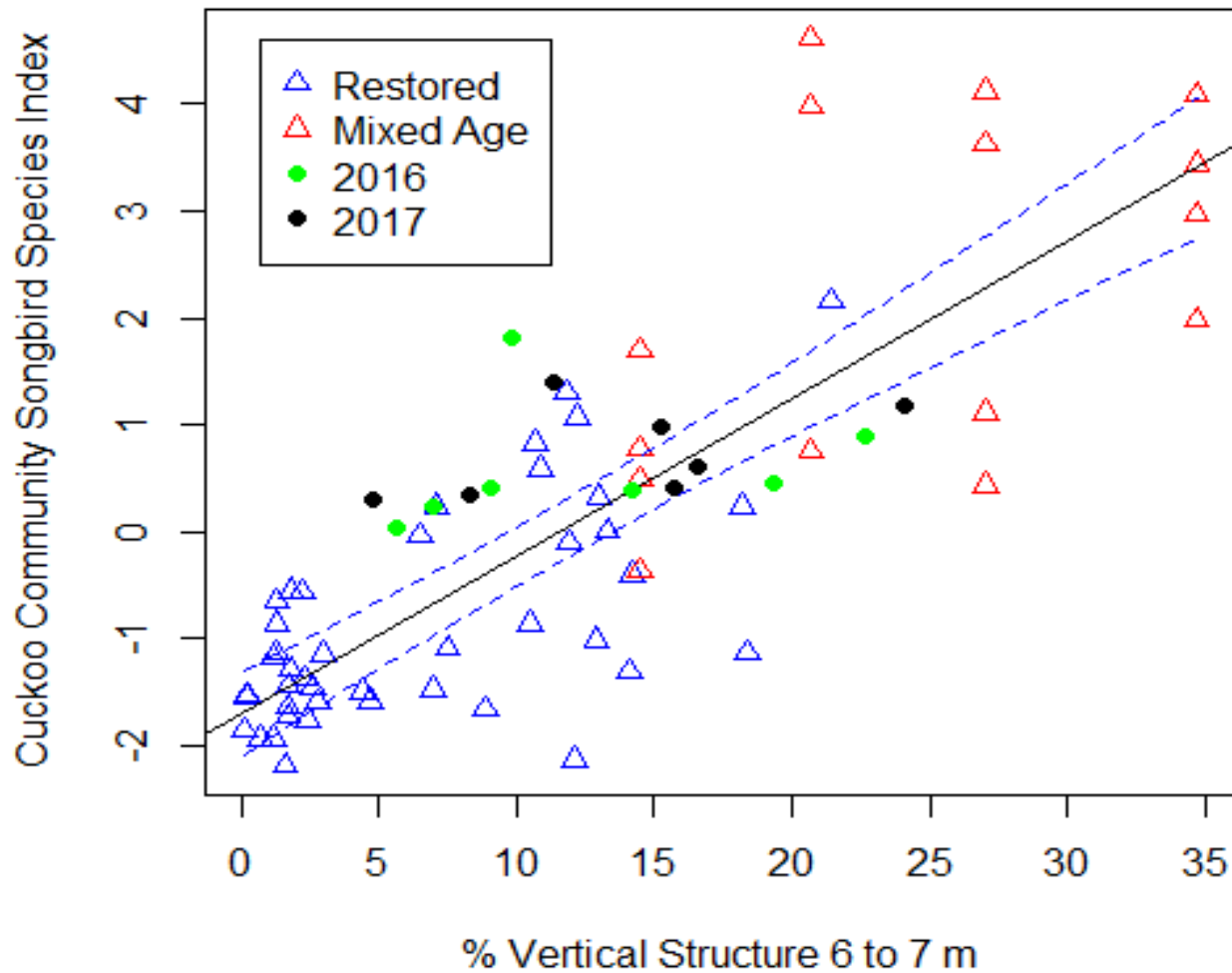
Results: Cuckoo Community with Vegetation

	K	AICc	ΔAICc	AICcWt	Cum.Wt	Res.LL
Vertical 6 to 7 m * forest type	5	174.5	0	0.17	0.17	-81.7
Vertical 6 to 7 m + Cottonwood/ ha	4	175.5	0.9	0.10	0.27	-83.37
Vertical 6 to 7 m + %Grass	4	175.7	1.1	0.09	0.37	-83.46
Vertical 7 to 8 m + %BareGrnd	4	175.7	1.1	0.09	0.46	-83.46
Vertical 6 to 7 m + %Grass	4	176.0	1.4	0.08	0.54	-83.61
Null	2	244.0	69.5	0	1	-119.9

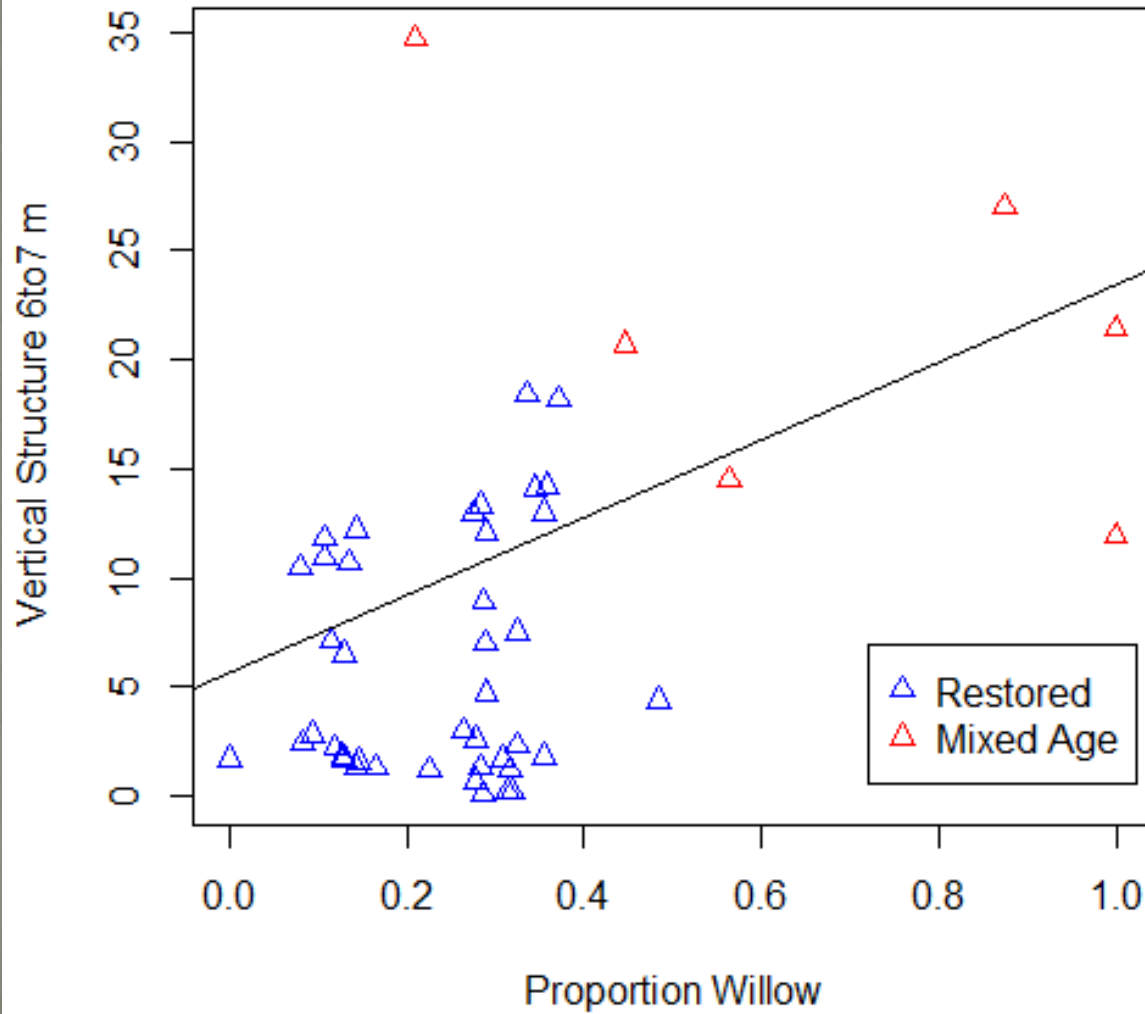
Variable	Estimate	SE	95%LCI	95%UCI
Vertical 6 to 7 m	0.14	0.02	0.11	0.17
Vertical 7 to 8 m	0.17	0.02	0.14	0.20
%Grass	-0.02	0.01	-0.04	0
%BareGrnd	0.03	0.02	-0.01	0.08



Multi-Age Songbird Community Index by Vertical Structure 6 to 7 m



Vertical Structure 6 to 7 m by Proportion Willow





Conclusions

- Use songbird community index as indicators for restoration success (CA SGCN)
- Restoration improved indicator index but ...
- Establish dense understory
- Promote natural regeneration vs planting
- Prioritize sites where water management possible
- Continue monitoring for desired conditions

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- Tyler Lau



Questions?



Current Trend in Kern River Valley

- Mean cuckoo detections declined by 85%
- Average detections from 4 surveys /yr
- Is this natural fluctuation due to drought or habitat?

