Corvid Density & Population Trends at Big Basin, 2003 - 2017

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Marbled Murrelet Recovery Zone 6 Management Meeting
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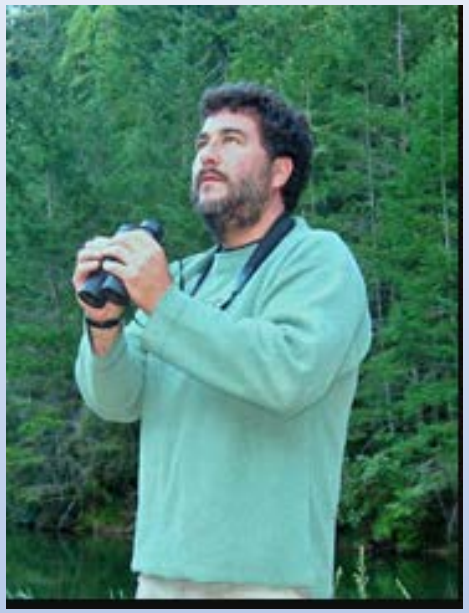
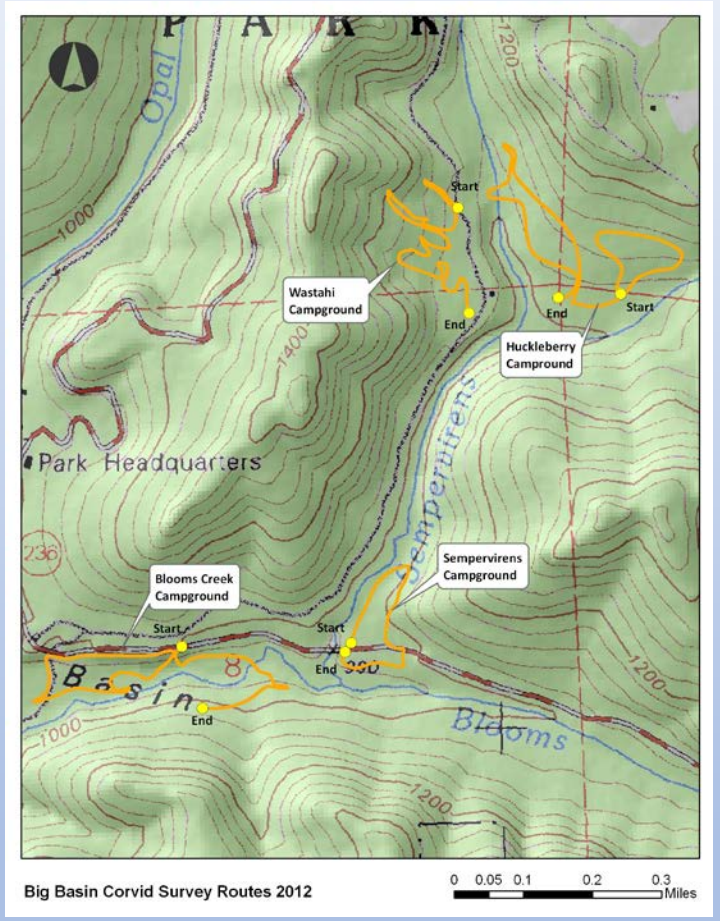
Background

- Corvids surveyed 2003 – 2008, 2012
- Study designed by David Suddjian
- Big Basin, Portola, Butano & Memorial
- Are corvid populations subsidized?
- Is management in parks effective in reducing corvid populations?



Survey Methods 2003 - 2012

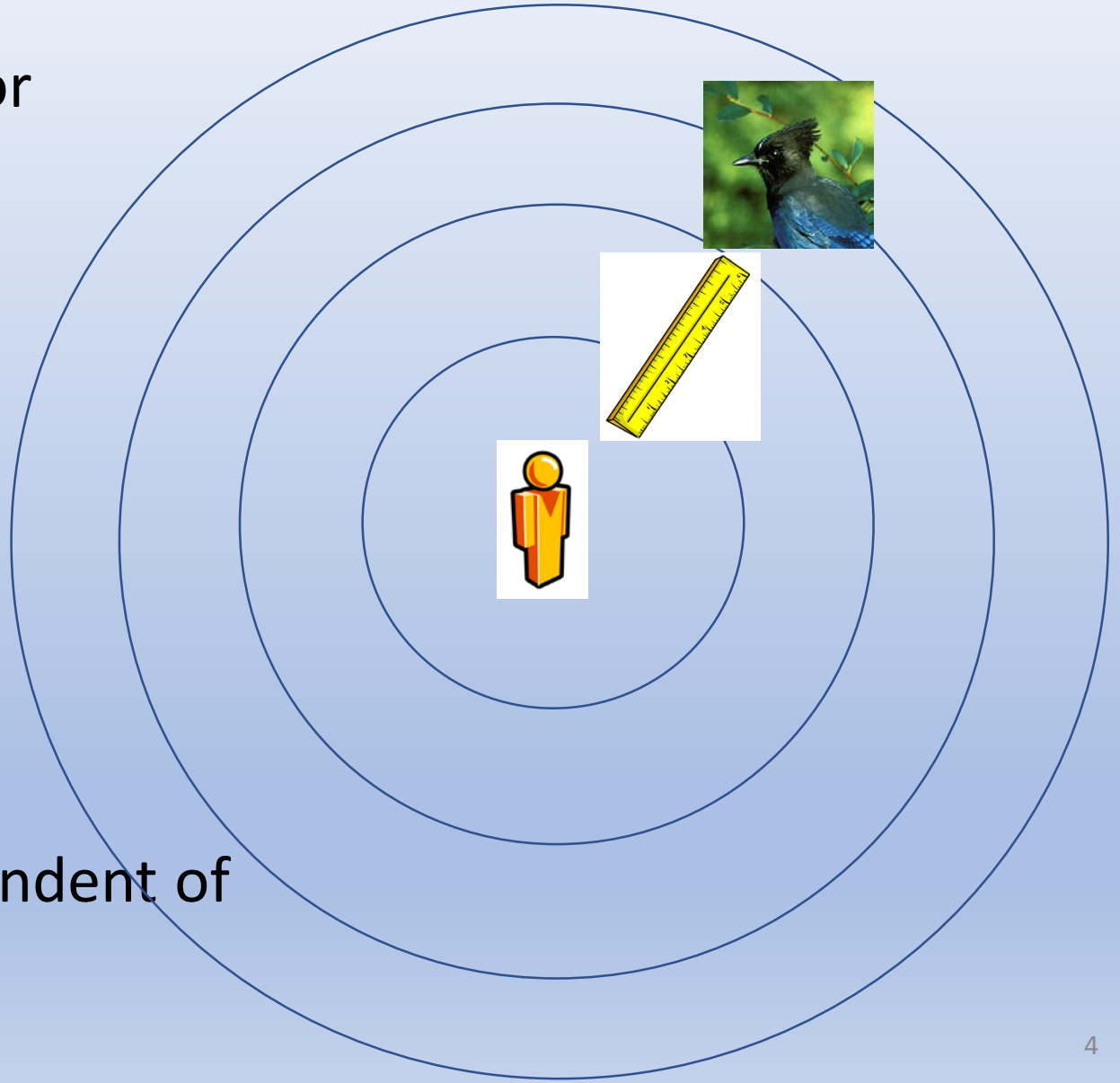
- 10 survey Plots: campground (4) & control (6)
- Area search method
- Observers walk plots & count all birds
- Estimate max. # corvids/plot
- Density can be calculated using plot size which varies



Halbert, P. 2012. Summary of 2012 Corvid Monitoring Surveys in the Santa Cruz Mountains

2017 Data Collection

- Distance sampling (mostly)
  - Fewer sources of potential error
- Fixed survey stations
- Record all species
- Estimate distance to corvids
- 10 min. observation window
- Provides density estimates independent of plot size

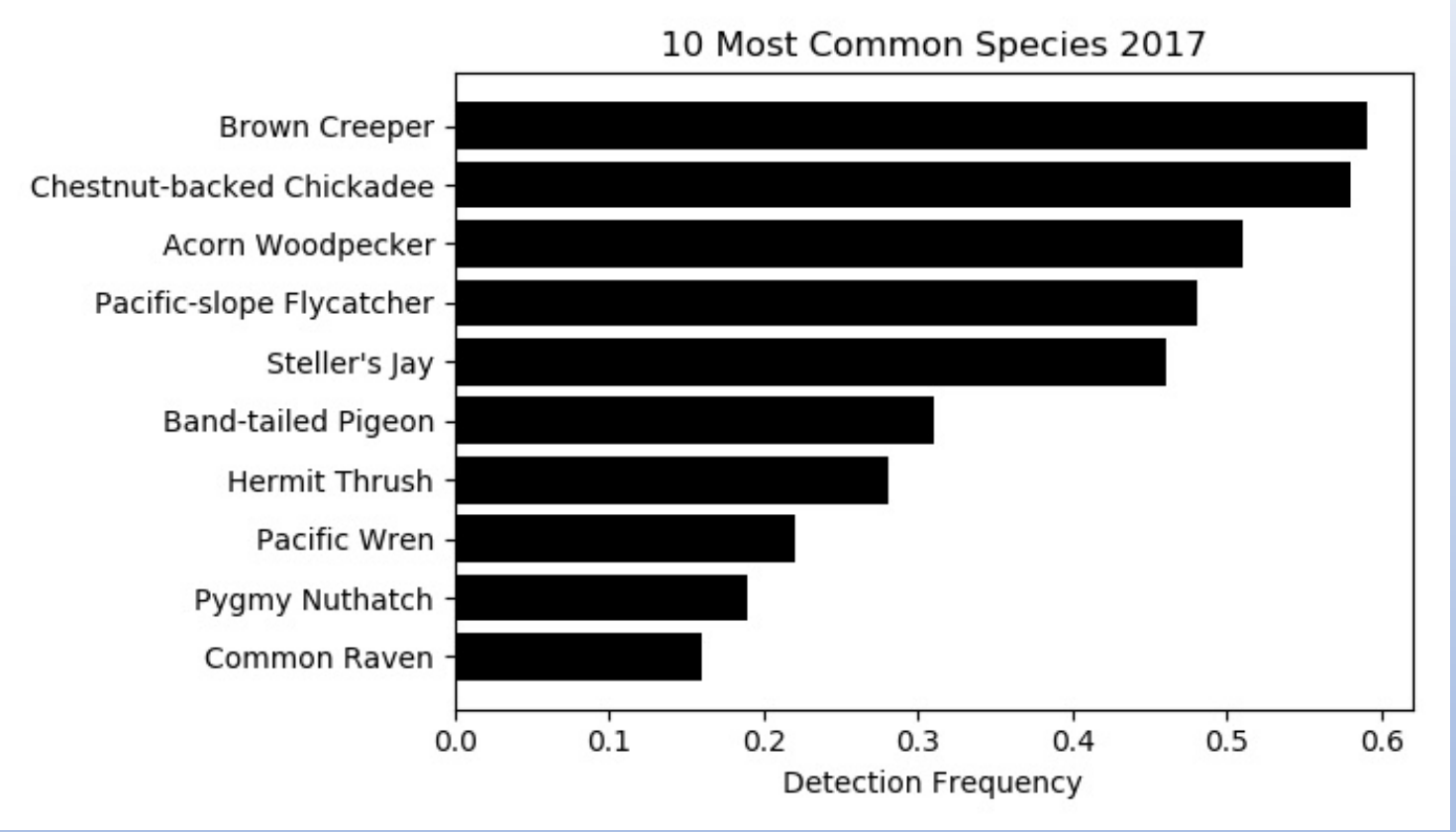


2017 Field Work

- June - August
- Surveyed each plot once using area search (n = 10)
- Established 2 - 6 survey stations/plot (plot size varies)
- Surveyed each plot 4x – distance sampling (n = 133)

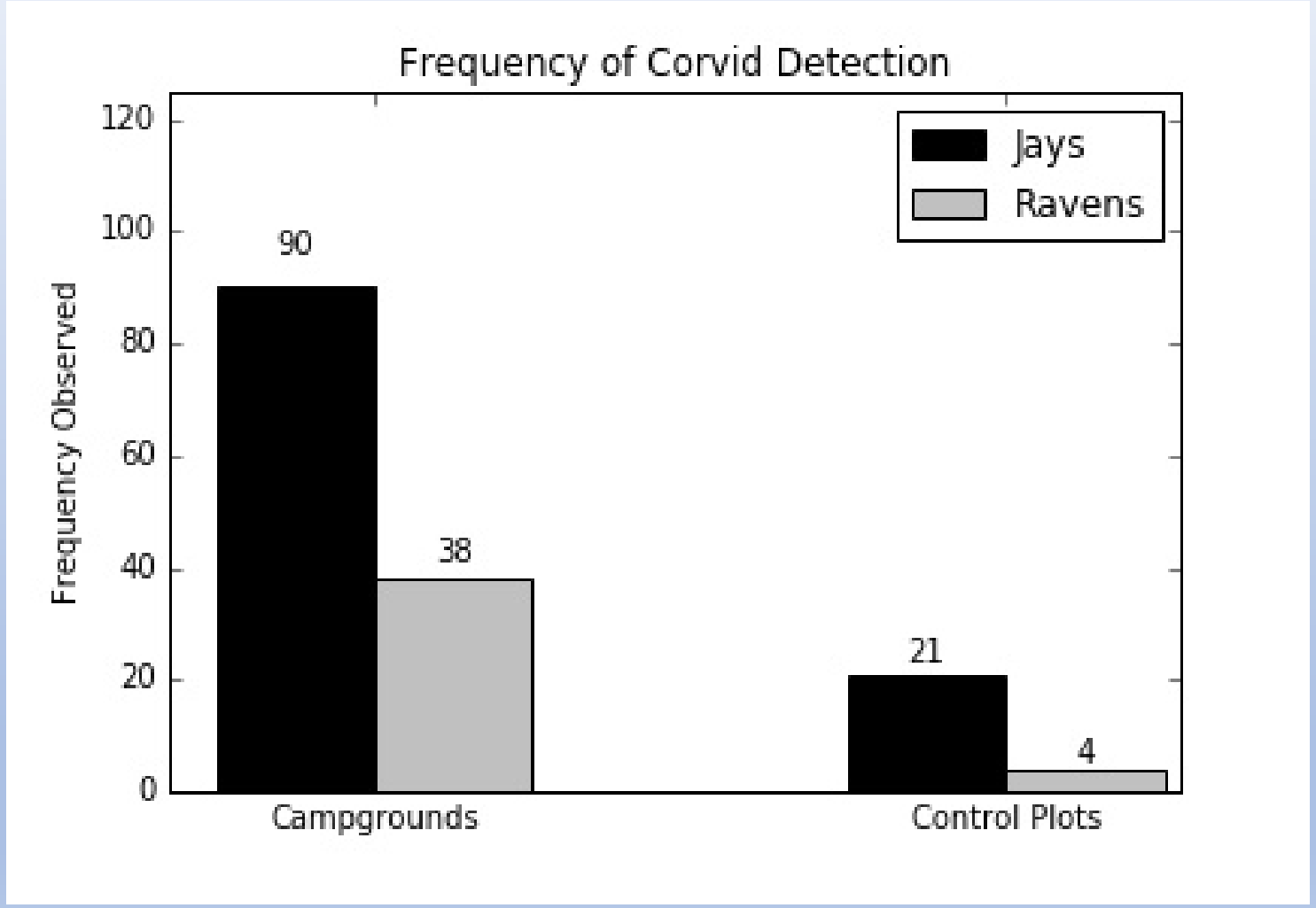
2017 Diversity & Abundance

- 25 avian species detected
- Steller's jays
  - 5th most common
  - Detected on 46% of all points
- Ravens
  - 10th most common
  - Detected on 16% of all points



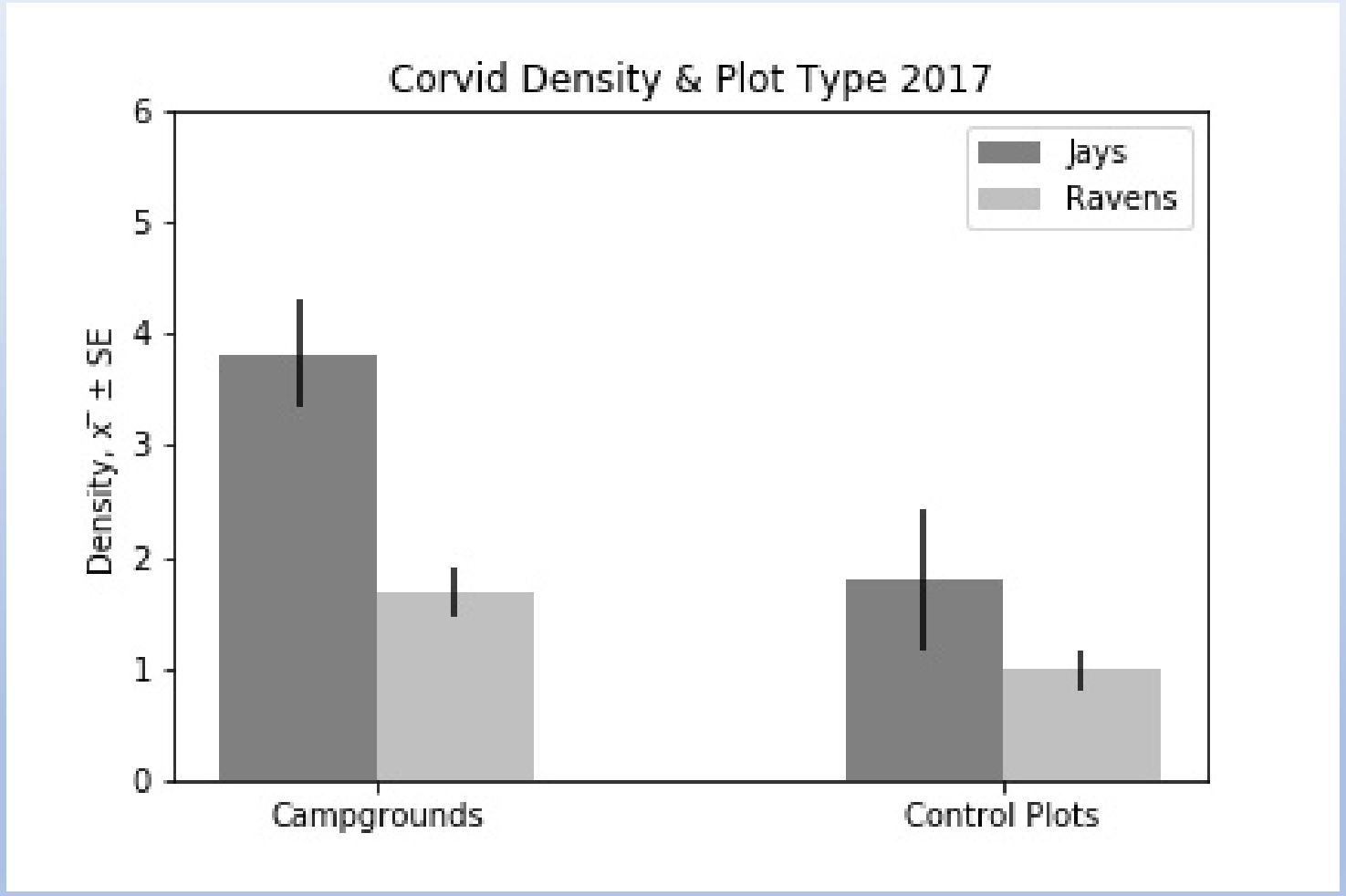
2017: Corvids Observed More in Campgrounds

- Greater bird diversity in control plots vs. campgrounds ($t_{458} = -4.21$; $p < 0.001$)
- Jays observed more frequently in campgrounds ($\chi^2_1 = 24.13$, $p < 0.001$)
- Ravens observed more frequently in campgrounds ($\chi^2_1 = 55.09$, $p < 0.001$)



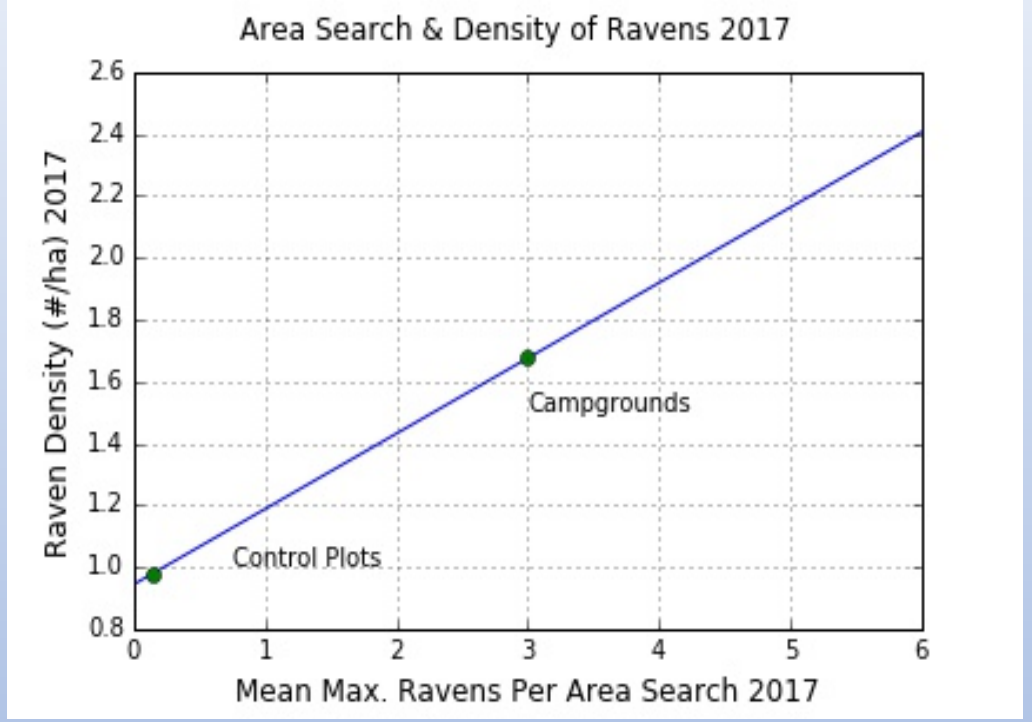
2017: Corvids More Abundant in Campgrounds

- Density estimates from distance sampling
- Jay density greater in campgrounds (Z = 2.63, p = 0.008)
- Raven density greater in campgrounds (Z = 2.46, p = 0.01).



Estimating Population Trends 2003 - 2017

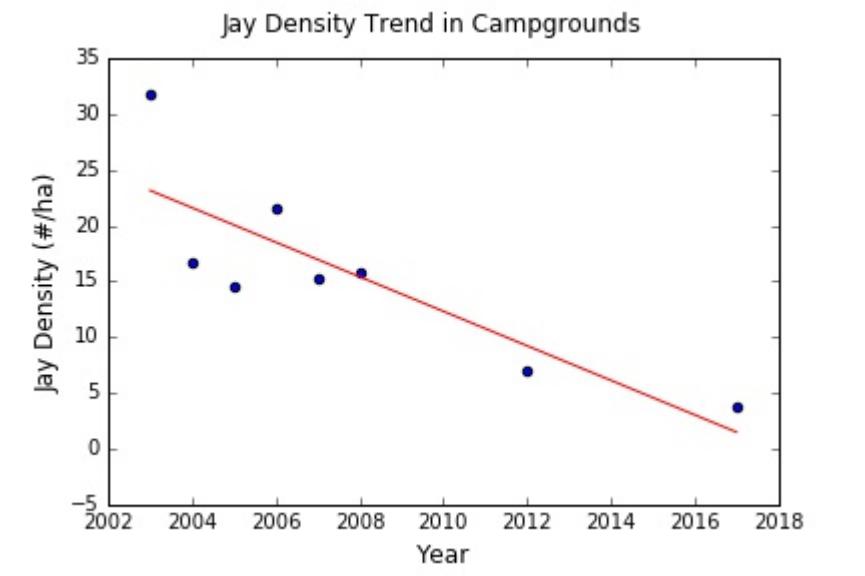
- Compared 2017 area search data & 2017 distance sampling data
- Generated “conversion factor” comparing max. # individuals(area search) & density (distance sampling)
- Estimated density for pre-2017 surveys
- Used OLS to detect significant trends 2003 - 2017



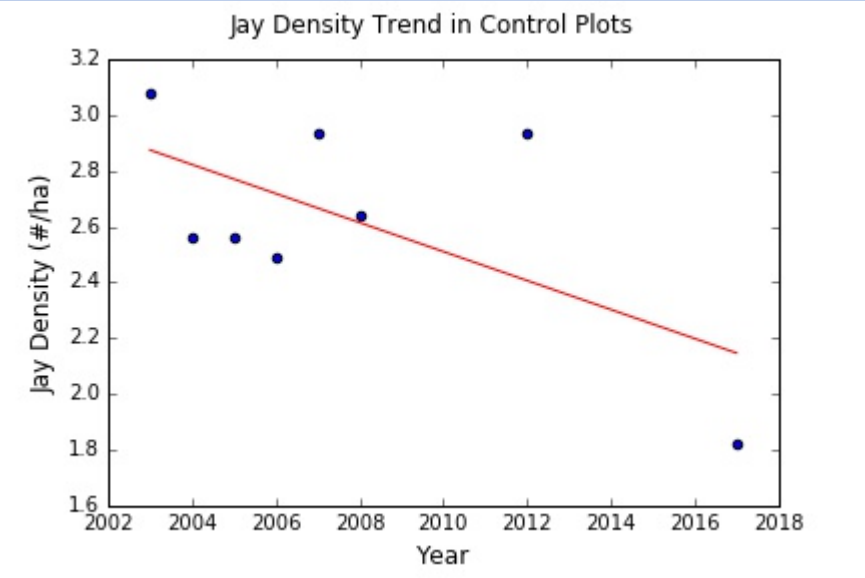
$y = 0.2434x + 0.9449$

Jay Population Trends 2003 - 2017

- Jay density declined in campgrounds ($R^2 = 0.70$, $p = 0.009$).

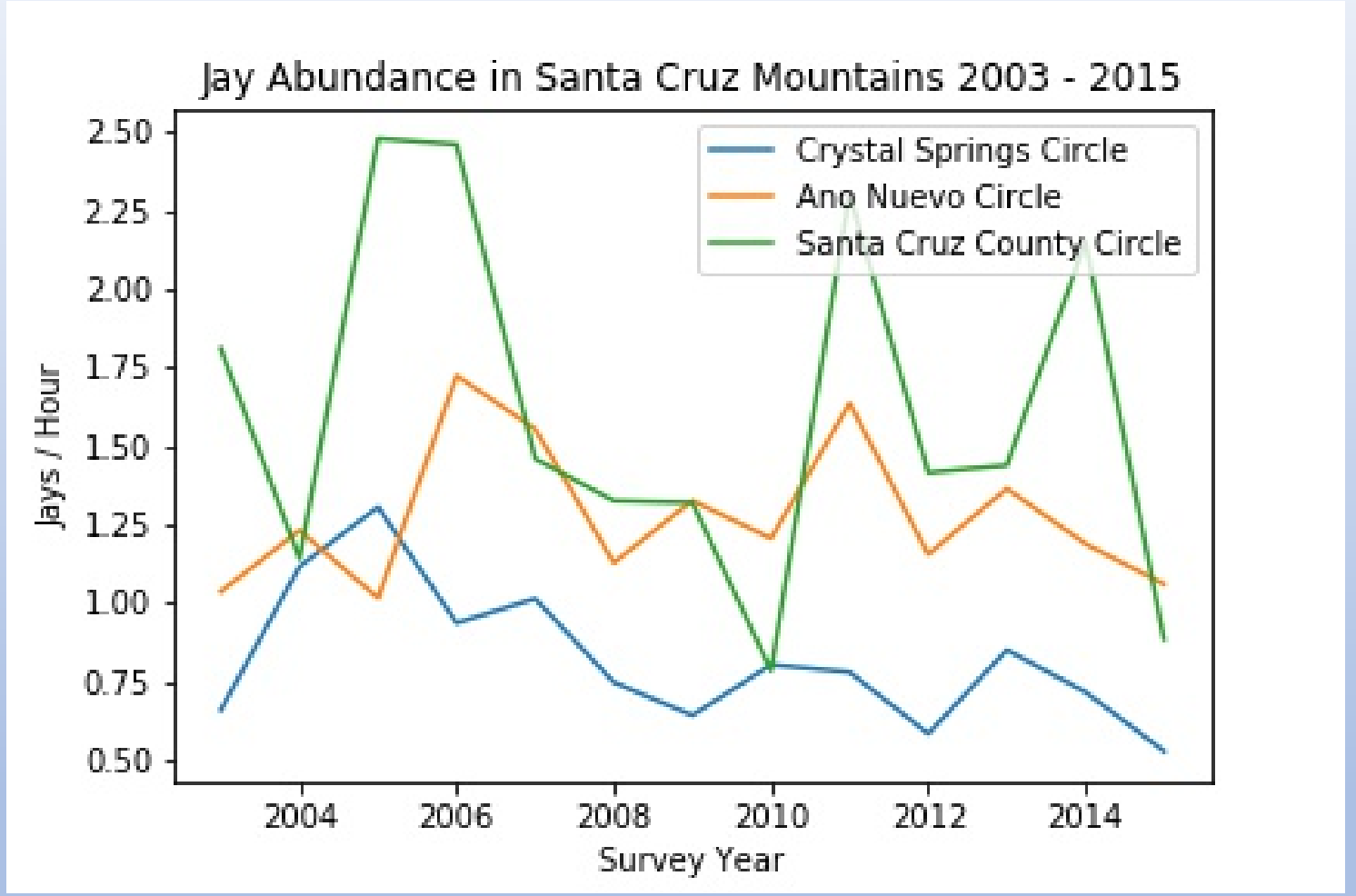


- Jay density did NOT change in control plots ($R^2 = 0.38$, $p = 0.096$)



Jay Abundance Santa Cruz Mountains 2003 - 2015

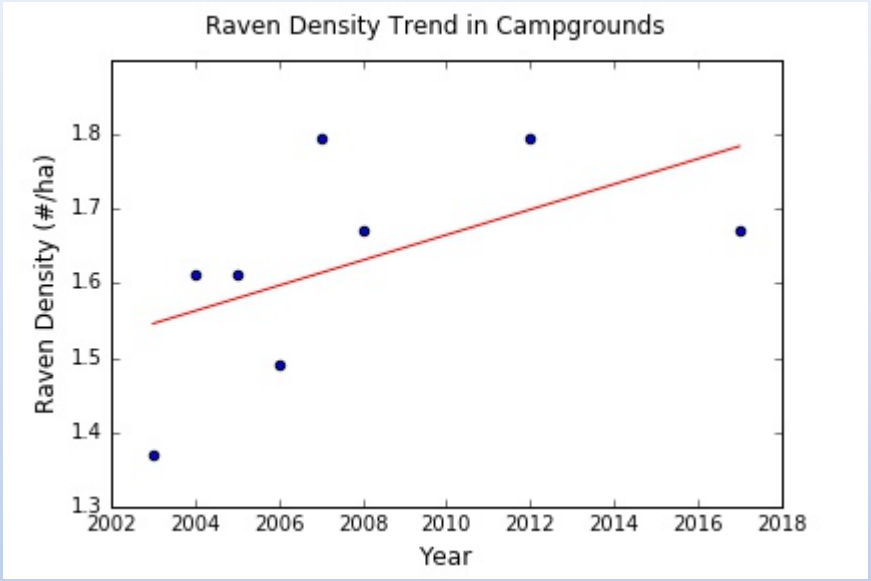
- CBC data
- Suggests stable or declining abundance*
- Differs from jay trends in campgrounds
- Park management efforts could be working (for jays)



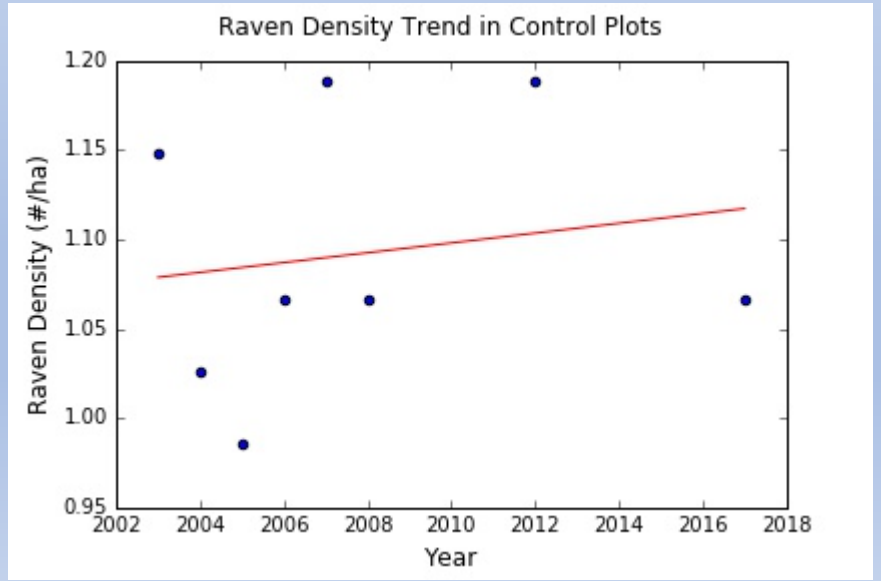
*Subject to statistical analysis

Raven Population Trends 2003 - 2017

- Raven density did NOT change in campgrounds (R^2 = 0.30, p = 0.176)

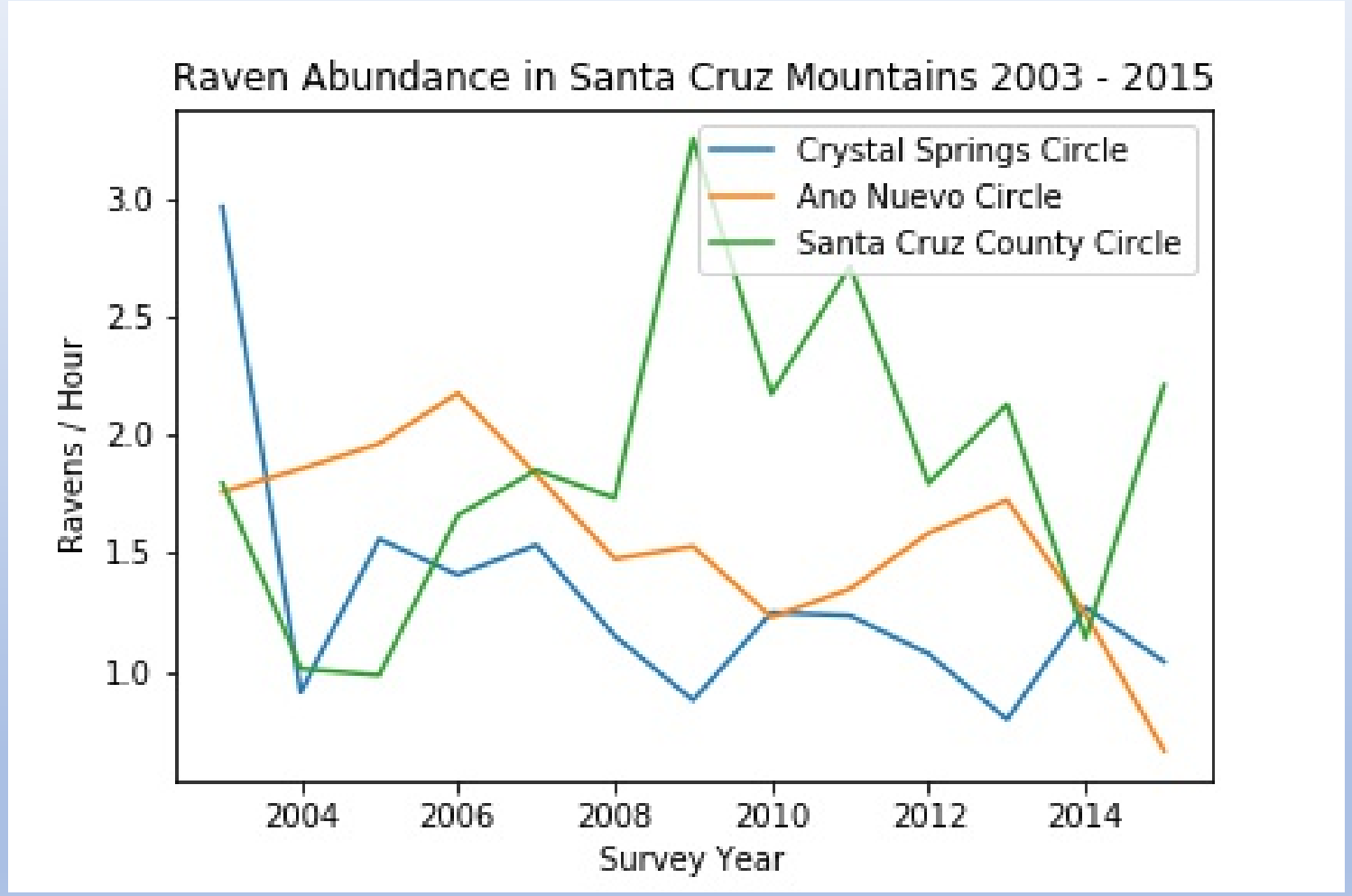


- Raven density did NOT change in control plots (R^2 = 0.03, p = 0.746)



Raven Abundance Santa Cruz Mountains 2003 - 2015

- CBC data
- Suggests stable or declining abundance*
- Similar to raven trends at Big Basin
- Park management may not be working (for ravens)



*Subject to statistical analysis

Landscape-scale Most Relevant for Raven Populations

- Ravens are long-lived and wide-ranging
- Raven populations respond to landscape-scale and regional processes
- Study plots probably too small to capture dynamics of raven populations
- Corvid management within parks alone likely insufficient to affect raven populations

Summary

- Avian community at Big Basin more diverse in control plots
- Corvids occur more frequently & are more abundant in campgrounds
- Jay density declined in campgrounds 2003 - 2017
- Raven density remained unchanged 2003 -2017
- Current management within parks alone might only be effective for jays

Thanks!

Questions?

Potential Sources of Survey Errors

Source	Area Search	Distance Sampling
Bird movement	X	X
Observer movement	X	
Reduced detectability due to distance	X	
Survey time	X	
Plot area	X	
Failure to count all birds	X	

1.) Park Corvid Surveys– Top Priority

- Monitor the effectiveness corvid management in parks
- Re-initiate corvid surveys
    - Distance sampling
        - Less biased compared to other methods
- Analyze existing & future survey data

2.) Identify & Reduce Park & Landscape-scale Food Subsidies

- Park Scale:
  - Continue Crumb-Clean Campaign & similar efforts within parks

- Landscape-scale:
  - Conduct landscape-scale corvid surveys

  - Identify subsides for ravens & crows near parks
    - Homes, ranches, farms, & road-kill

  - Develop & encourage BMP's for property owners

3.) Identify & Reduce Regional Food Subsidies

- Increasing crow & raven populations also driven by regional processes
- Regional-scale:

  - Identify point subsidies:
    - Landfills, sewage treatment plants, etc.
    - Anything that attracts & subsidizes large numbers of crows & ravens

  - Conduct corvid surveys at potential point subsidies
  - Develop & encourage BMP's for property managers
    - Effective for ravens at landfills in Mojave Desert

4.) Use CTA on Ravens

- Conditioned taste aversion (CTA) to MAMU eggs and/or nestlings
    - CTA shown effective for ravens*
    - “Train” ravens to avoid MAMU nests
    - “Trained” territorial holders exclude untrained ravens
    - Potential long-lasting effects given raven longevity (15+ years)

*Nicolaus, L. K. 1987. American Midland Naturalist **117**:405-419.*
*Avery et al. 1995. Colonial Waterbirds **18**:131-138.*

5.) Fill Basic Knowledge Gaps

- Ecology & behavior of local raven & crow populations mostly unstudied

- Potential topics to address:

    - Diet
    - Habitat use
    - Demography – survival & reproduction
    - Predatory behavior: Do ravens remember & return to MAMU nest sites?