

Starting Small: Population size and distribution of the Puaiohi, an endangered Kauai endemic



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Why do we need to know population size?

- Recovery
 - Set targets, assess progress
- Management
 - Risk of extinction, genetic issues, take
 - Impacts of reintroductions
- Population trajectory
- But population estimates often lacking, (even) for endangered spp.

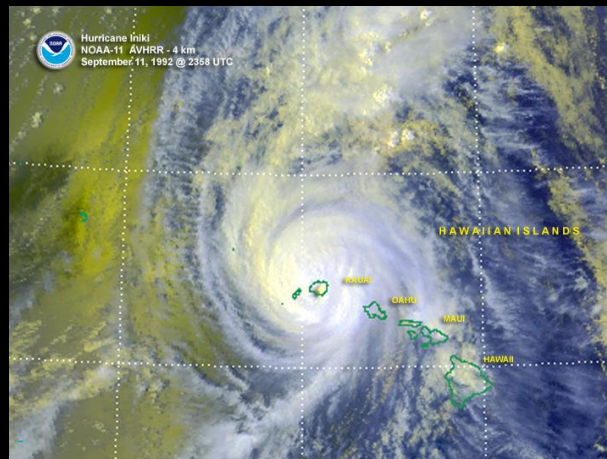


Puaiohi

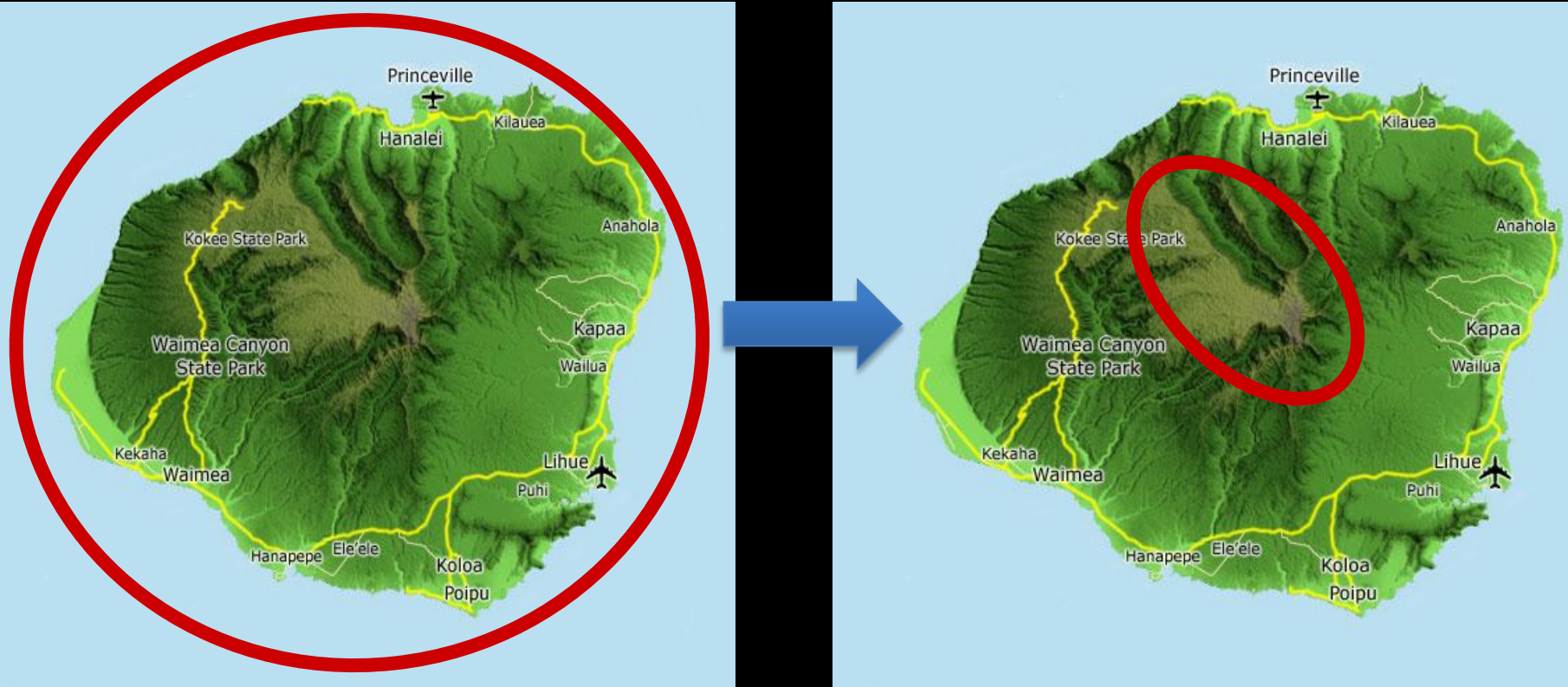


- Small thrush
- Endemic to Kauai
- Frugivorous
- Secretive (last to be discovered)
- Sexually monomorphic
- Never considered common (< 200 birds)
- Listed as endangered in 1967

Threats



Range Contraction



Survey of the Alakar Plateau



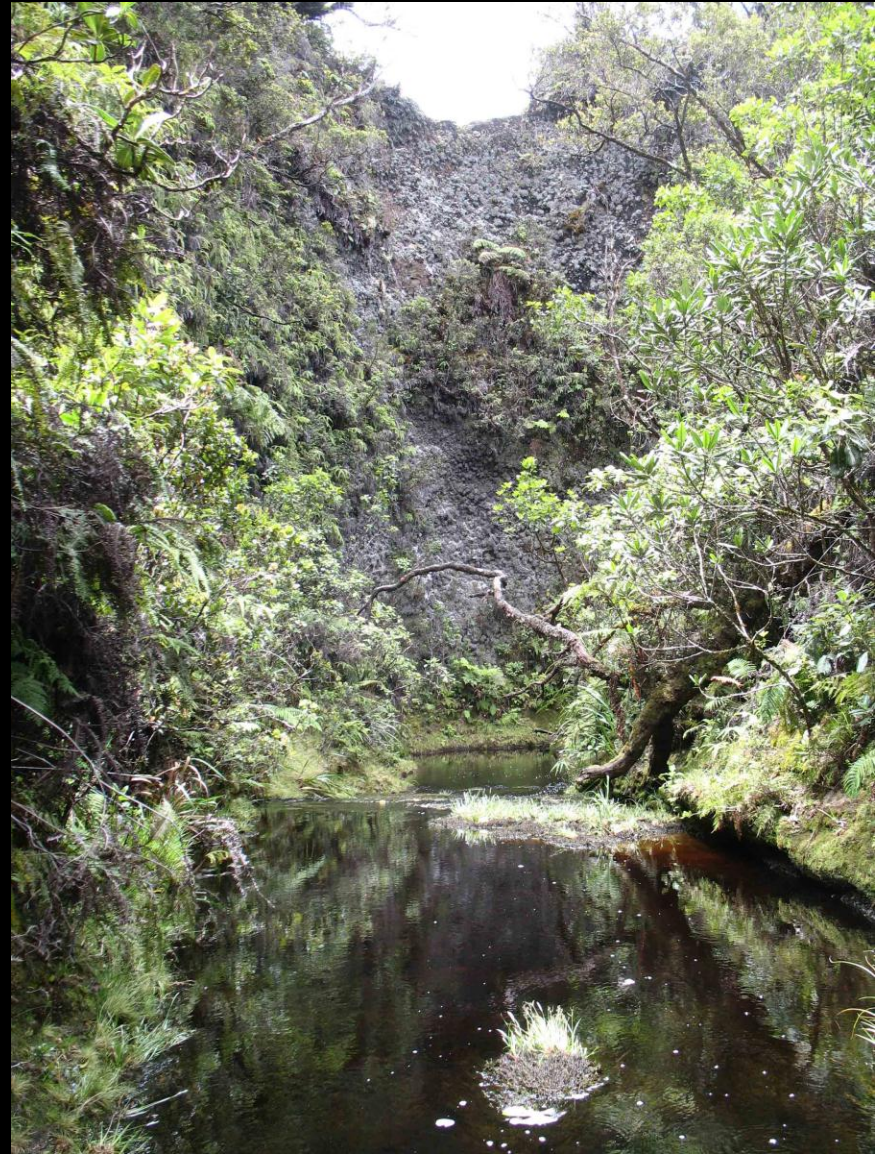
After Iniki (1992)

- Kauai O'o never seen
- Kama'o never seen
- Puaiohi???
 - Found in low numbers
 - Start captive breeding in 1996
 - Coupled with intensive monitoring



Challenges to estimating # Puaiohi

- Stream specialist
 - Usually nests on vertical faces
- Poor detection in most (ridge top) surveys
- Straight-line transects not practical
- Estimates don't apply to/not made for range



Puaiohi Survey Methods

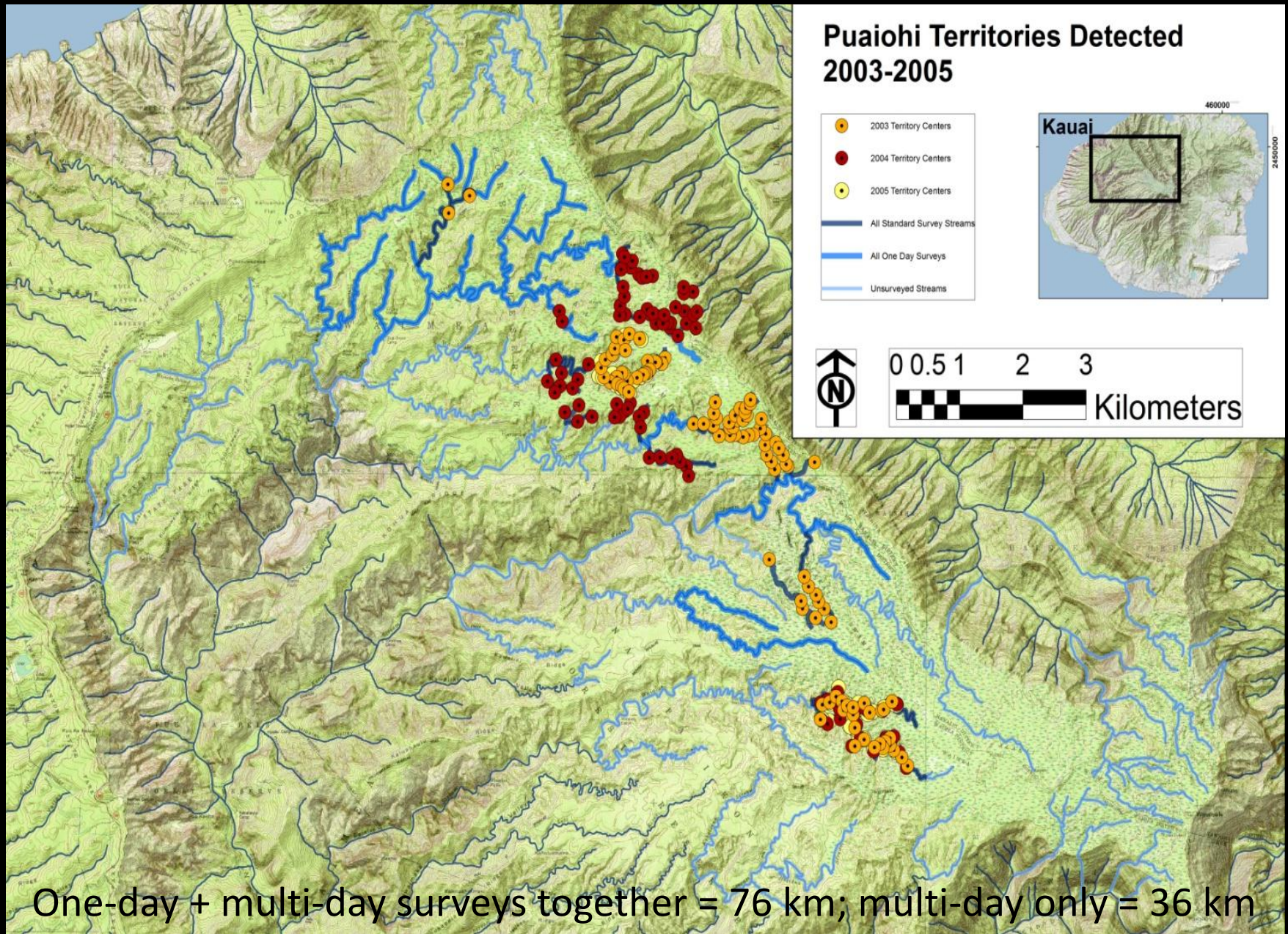
- Single observer walks stream
- 30 m per min, record all birds
 - Did not record absence
- Stop every 50-100 m for point count

IF Puaiohi detected or looks good, then gets multi-day survey

- 4 to 7 days repeated



Study areas and distribution




Our approach

- Determine # territories in sub-sample of streams → # territories/km in study area
- Estimate how many individuals/territory (pairing frequency) and multiply by that
→ # individuals/km in study area
- Then multiply by area of potential habitat

$$\# \text{ birds} = \# \text{ terr/km} * \# \text{ indiv/terr} * \# \text{ km habitat}$$

Survey Results: # Territories

	Km	Territories	Av. Terr/km
1-day surveys	43.5 km	0	0
Multi-day surveys	32.6 km	169	5.2
Total surveyed	76.1 km	169	2.2 (mean)



Min. # adults



Ranged from
1.3 to 15.8

In other words, at least 169 territories, without accounting for unsurveyed area and pairing!

Now account for pairing:

- Pair data from 2003 surveys (most intensive yr)
 - 104 territories

61 % paired

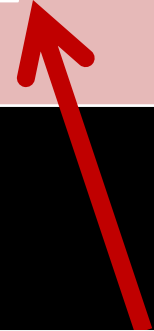


39 % no pair detected



Survey Results: # Individuals

	Territories	% paired	# adults per terr	Min. adults
2003	104	61%	1.61	169
2003- 2005	169	assume 61%	1.61	272



Low index of
population of study
area. Higher than any
estimate to date

How accurate are pairing estimates?

- Test at HPK site
 - Population surveys in 2003-2005
 - Intensive observations in 2007-2009
- Estimates of pairing success at HPK:

Survey 2003: 71% (N = 24)

Survey 2005: 33% (N = 27)

Intensive 2007: 89% (N = 19)

Intensive 2008: 89% (N = 18)

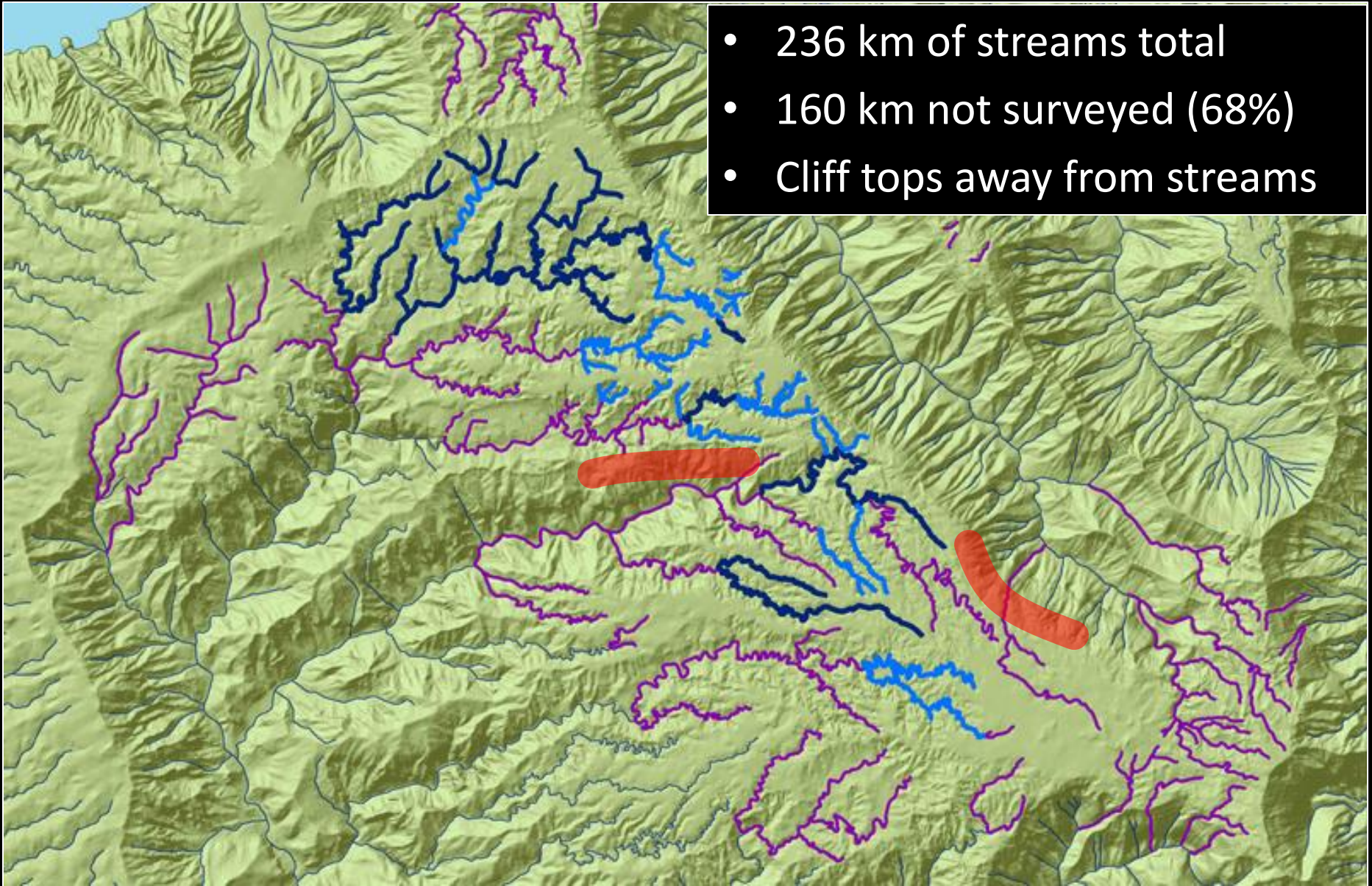
Intensive 2009: 96% (N = 27)



Population surveys may substantially underestimate pairing success! 61% is conservative.

Likely Puaiohi Habitat

- 236 km of streams total
- 160 km not surveyed (68%)
- Cliff tops away from streams



Extrapolate to likely habitat

At 61% paired, low (1.3) territory density:

Surveyed: 169 terr * 1.61 adults/terr = 272
 Unsurveyed: 1.3 terr/km * 1.61 adults/terr * 160.3 km = 336
 = **607 adults**

At 61% paired, mean (2.2) territory density:

Surveeyed: 169 terr * 1.61 adults/terr = 272
 Unsurveeyed: 2.2 terr/km * 1.61 adults/terr * 160.3 km = 573
=845 adults

In summary...

Calculation	# Adults	Comment
Survey	169	Min. For Sure!
Low index for study area	272	Based on 61%
Low-med index for range	607	Based on 61% and low terr. density
Med-high index for range	845	Based on 61% and mean terr. density



What about trends?

- HPK area surveyed 2003-2005, intensive study 2007-2009.

	Territories	% paired
Survey 2003	24	71
Survey 2004	24	?
Survey 2005	27	33
Intensive 2007	19	89
Intensive 2008	18	89
Intensive 2009	27	96

No dramatic trend at HPK

More thoughts on trends

- Reynolds et al. (1997) surveyed similar set of streams in 1995-1996
 - Estimate of 145 ± 19 adults
 - Our index: 272 adults (min. 169 adults) from same general area in 2003-2005
- No dramatic trend



Conclusions

- Puaiohi population size:
 - 169 known
 - 272 low-moderate index
 - 607 moderate-high index
- Pairing success probably high
- Probably not crashing



What's next?

To improve estimates of population size:

1. Refine pairing success estimate
 - Variation among stream sections surveyed
2. Evaluate habitat quality in unsurveyed areas
 - Can we match Puaiohi found on surveys with physiographic predictors?
 - Elevation, slope, aspect
 - Rainfall?
3. Determine detection probability
 - Existing data
 - New surveys



Mahalo

- **USGS**
- **DOFAW**
- **USFWS**
- **Early KFBRP team members,
especially Tom Savre**