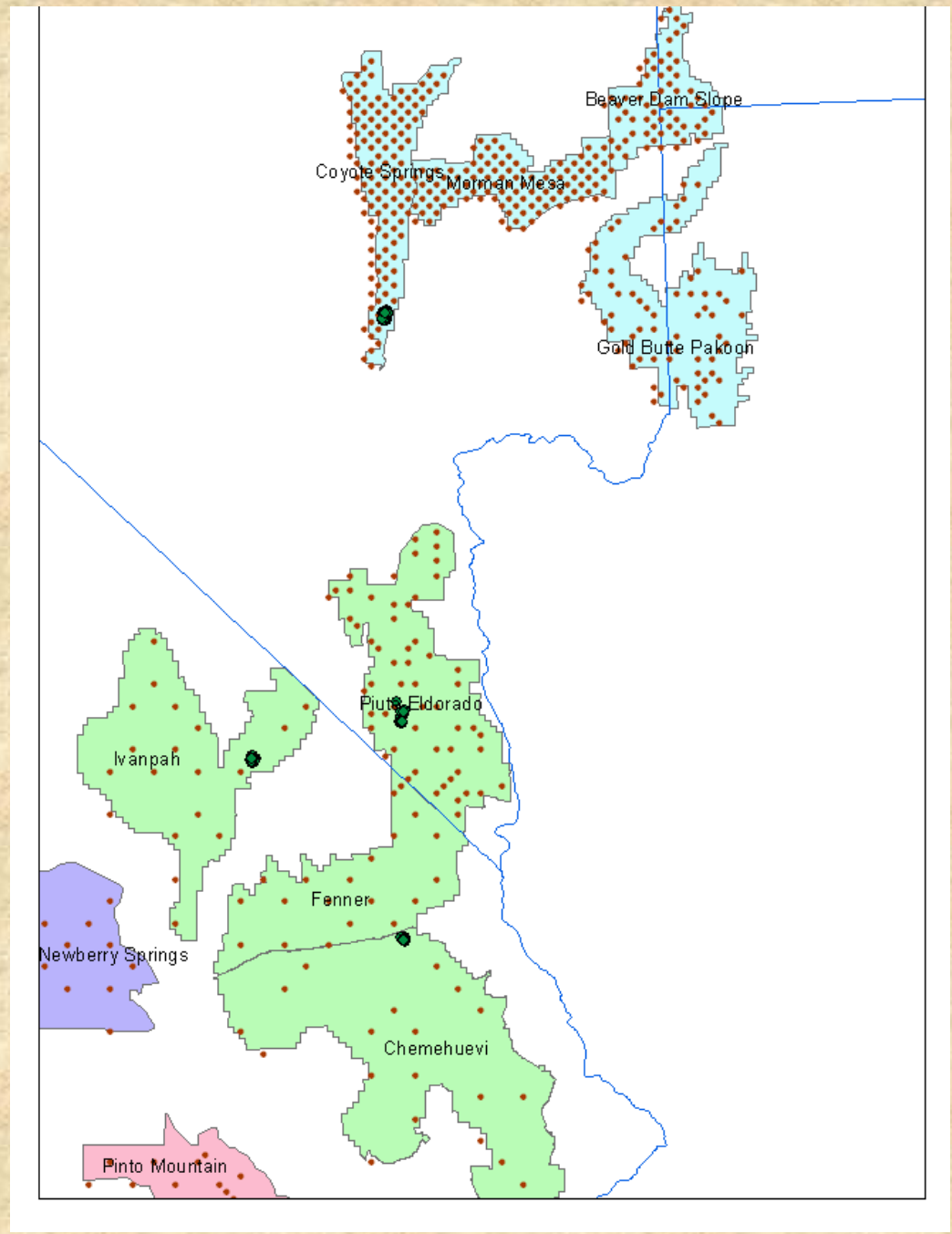
Desert Tortoise (*Gopherus agassizii*) Monitoring 2009

2007-FWS-785



Range-wide Monitoring Program

Long-term monitoring strata

Goals and Objectives

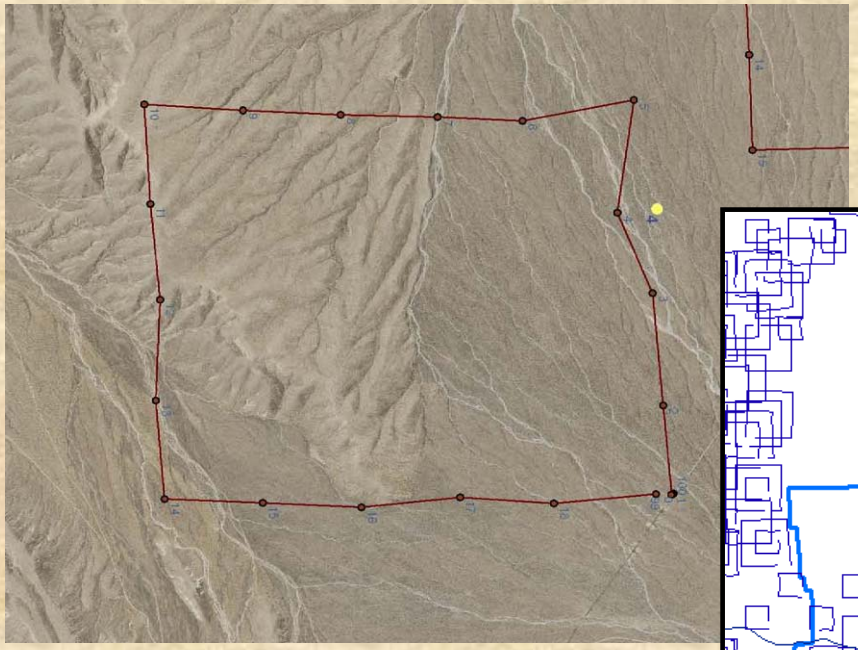
1. Provide specialized training of field crews
2. Adaptively identify any techniques to improve effectiveness and/or cost of tortoise monitoring
3. Establish a baseline tortoise density estimate for later evaluation of recovery activities

Approach

1. Use quality control and assurance measures carried through the range-wide monitoring program.

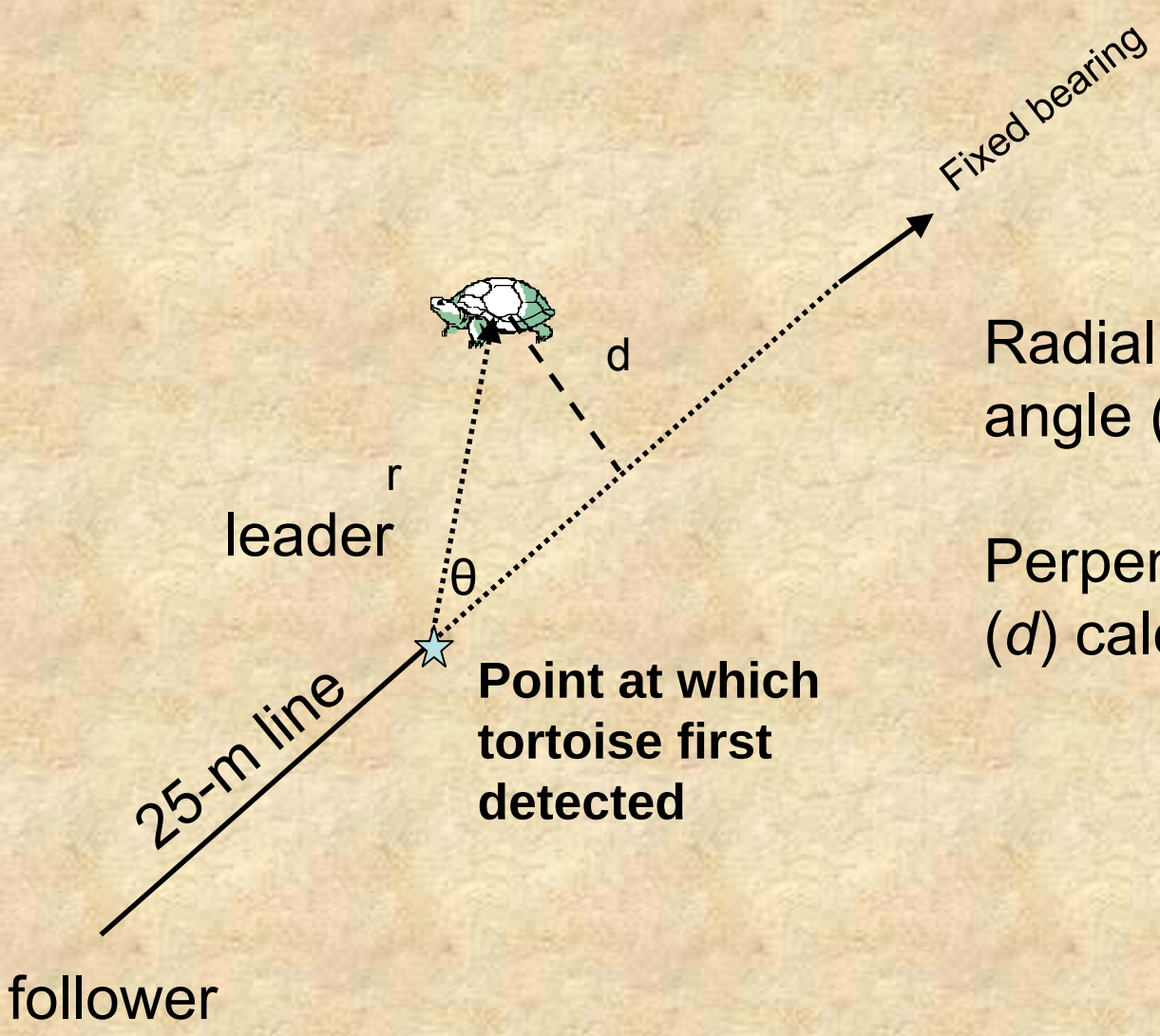
2. Use existing data to identify efficient changes to improve precision of density estimate

3. Adaptively improve elements of the monitoring program




Rox
Glendale

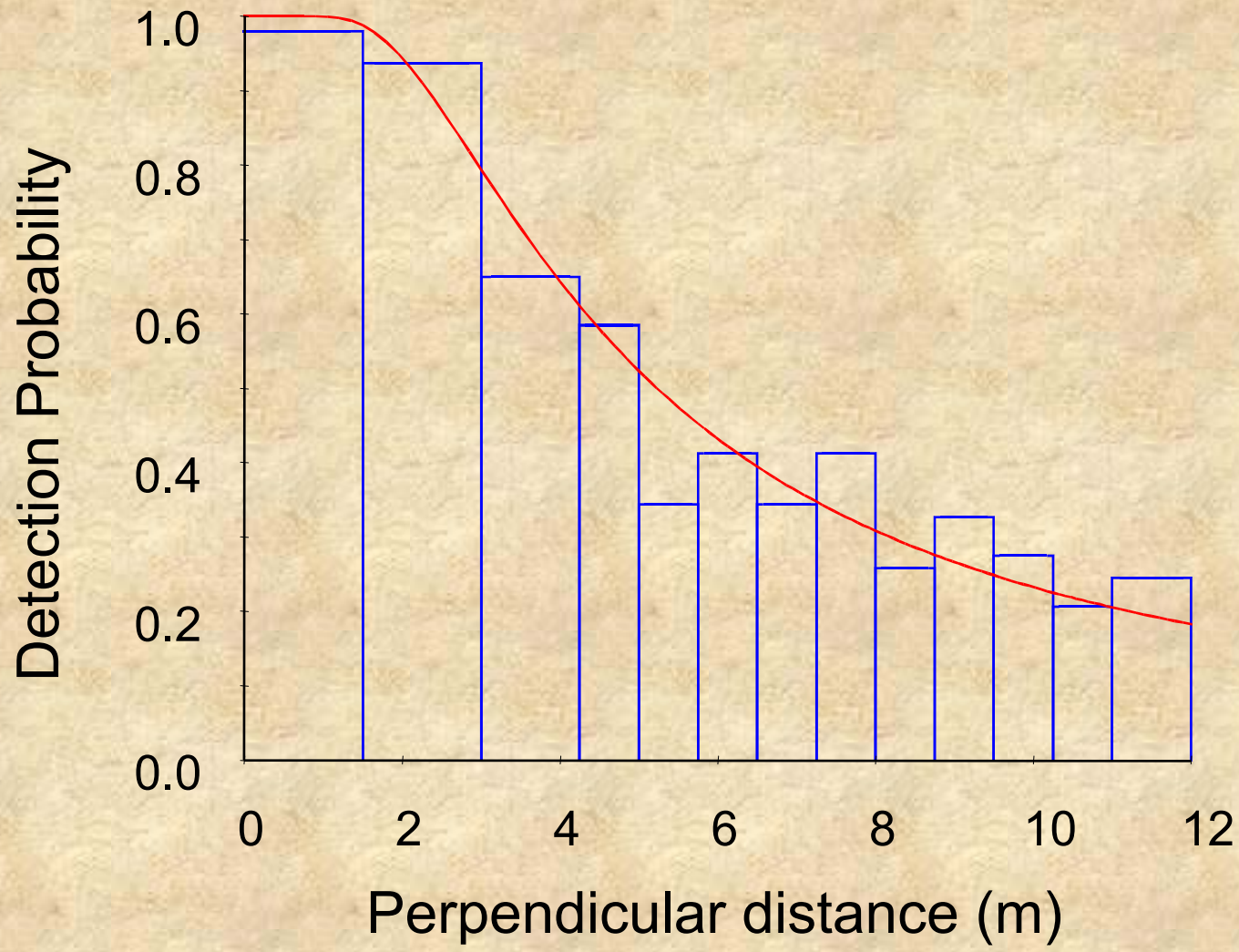
Distance of Tortoise from Line



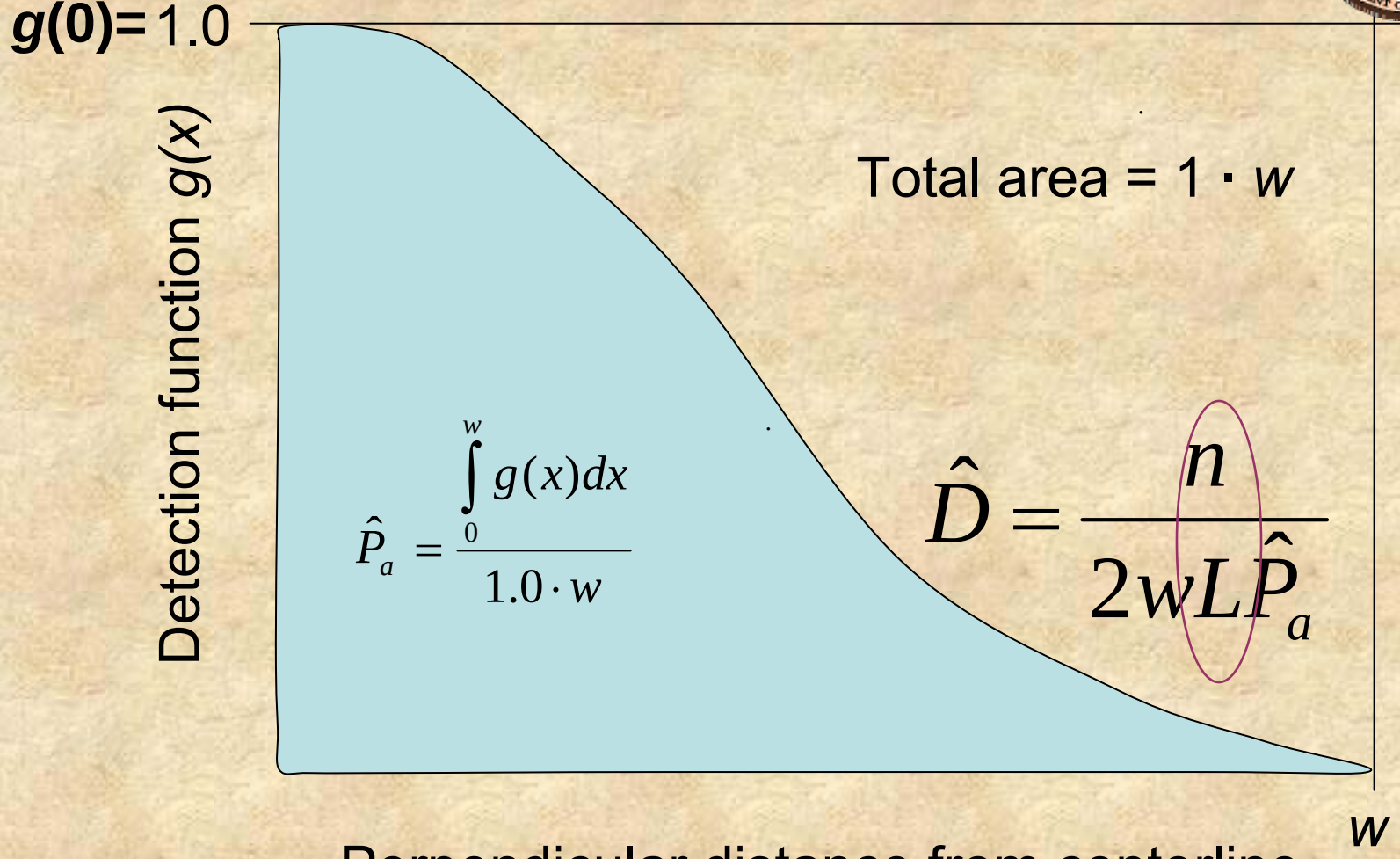
Radial distance (*r*) and angle (*θ*) measured.

Perpendicular distance (*d*) calculated.

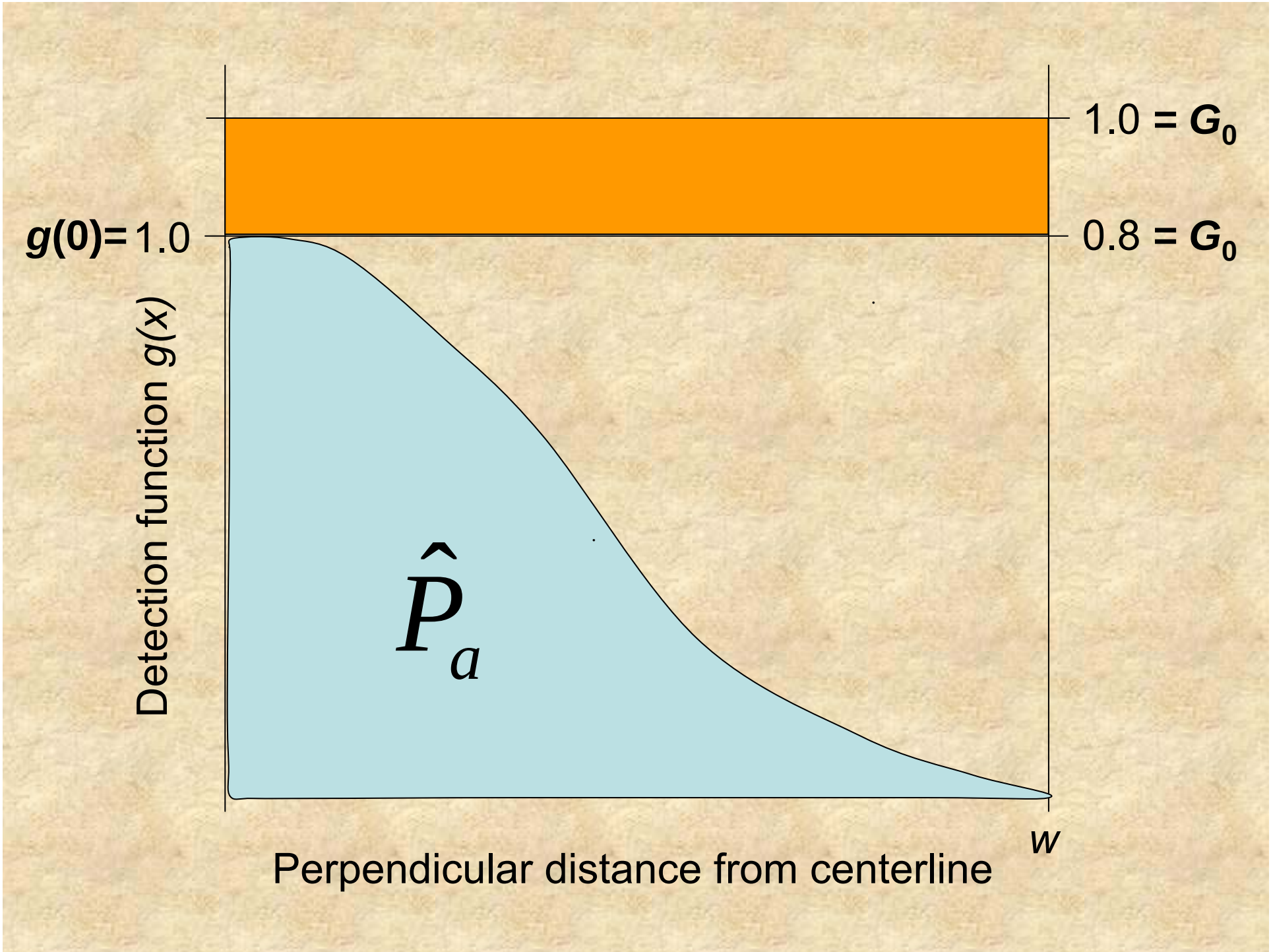
Detection Curve



Detection Curve



Estimating Detection on the Line – g(0)


1.0 = G_0
$g(0)$= 1.0
0.8 = G_0
Detection function $g(x)$
$\hat{P}_a$
w
Perpendicular distance from centerline

Components of the Density Estimate

- Detection probability - P_a
- Proportion detected on the line - *g(0)*
- Tortoises per kilometer walked - *n/L*
- % of tortoises available to count – G_0

Goal 1: Training to improve data collection

http://www.fws.gov/nevada/desert_tortoise/reports

Goal 1: Improve training

- Moving focus of quality control closer to data collection – intensive training of crews and data specialists
  - *Data errors in 2009 less than 1/3 the level of 2008*

- Evaluations given to each crew regarding:
  - *Detection curves*
  - *Leader and team detection of tortoises within 1m of the line*
  - *Accurate use of compasses to measure tortoise distance from the line – close compass work*

Goal 2: Improve effectiveness and/or cost of tortoise monitoring

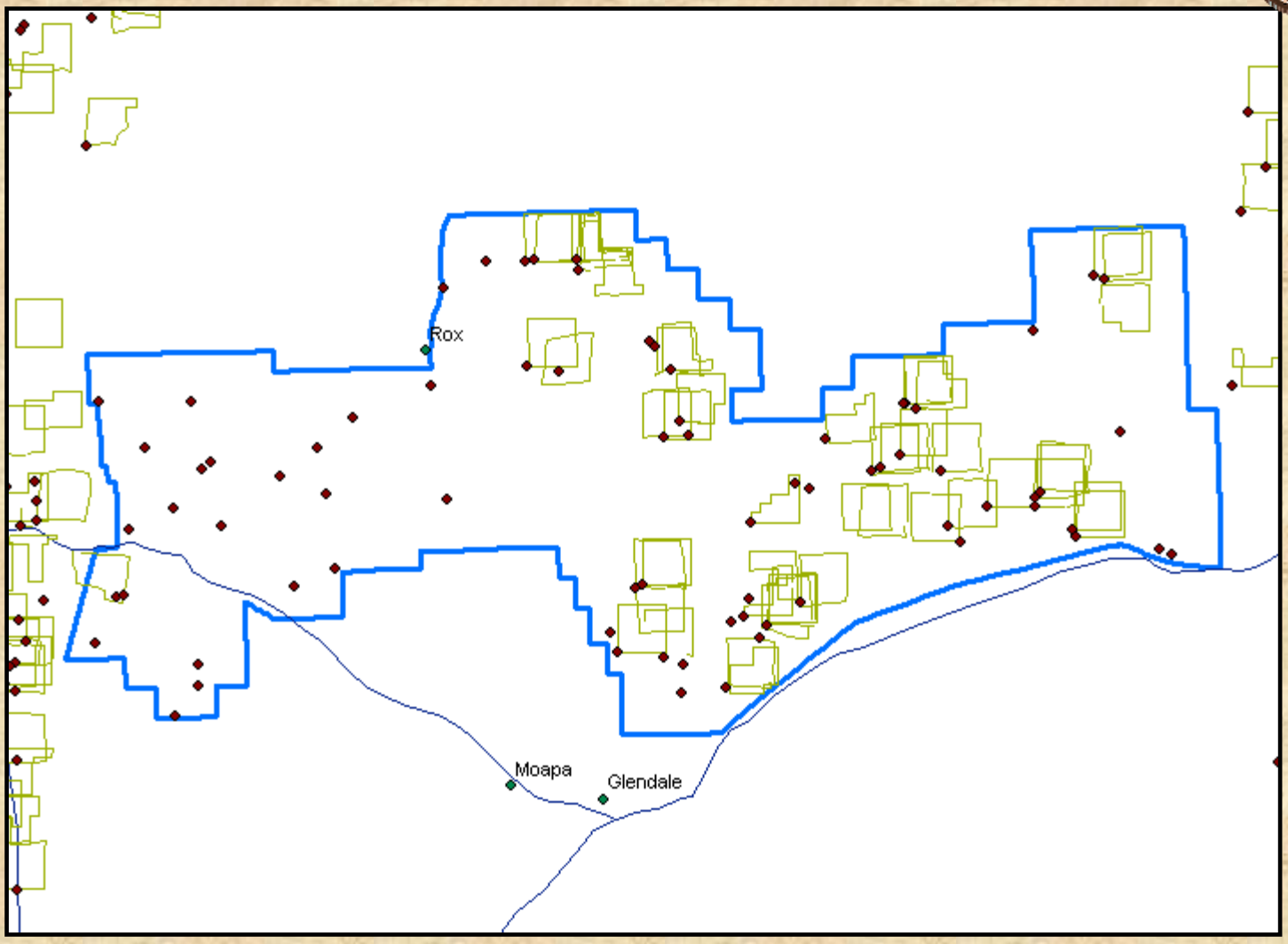
- Quality assurance
- Minimize bias
  - Cover all regions of interest
  - Consistent data collection
- Increase precision
  - Number of transects/tortoises sampled
  - Estimating undetectable portion (G_0)
  - Estimating undetected portion on the surface
  - Can we develop good enough estimates for smaller spatial areas?

Goal 2:
Improve effectiveness and cost
Quality Assurance

- Training to standards
- Constraining data entries – data collection system (UNR)
- Data verification (GBI – subcontractor to FWS)
- Weekly data validation (FWS)
- Final data validation (MDEP)
- Data and analysis usability (FWS and Topoworks)

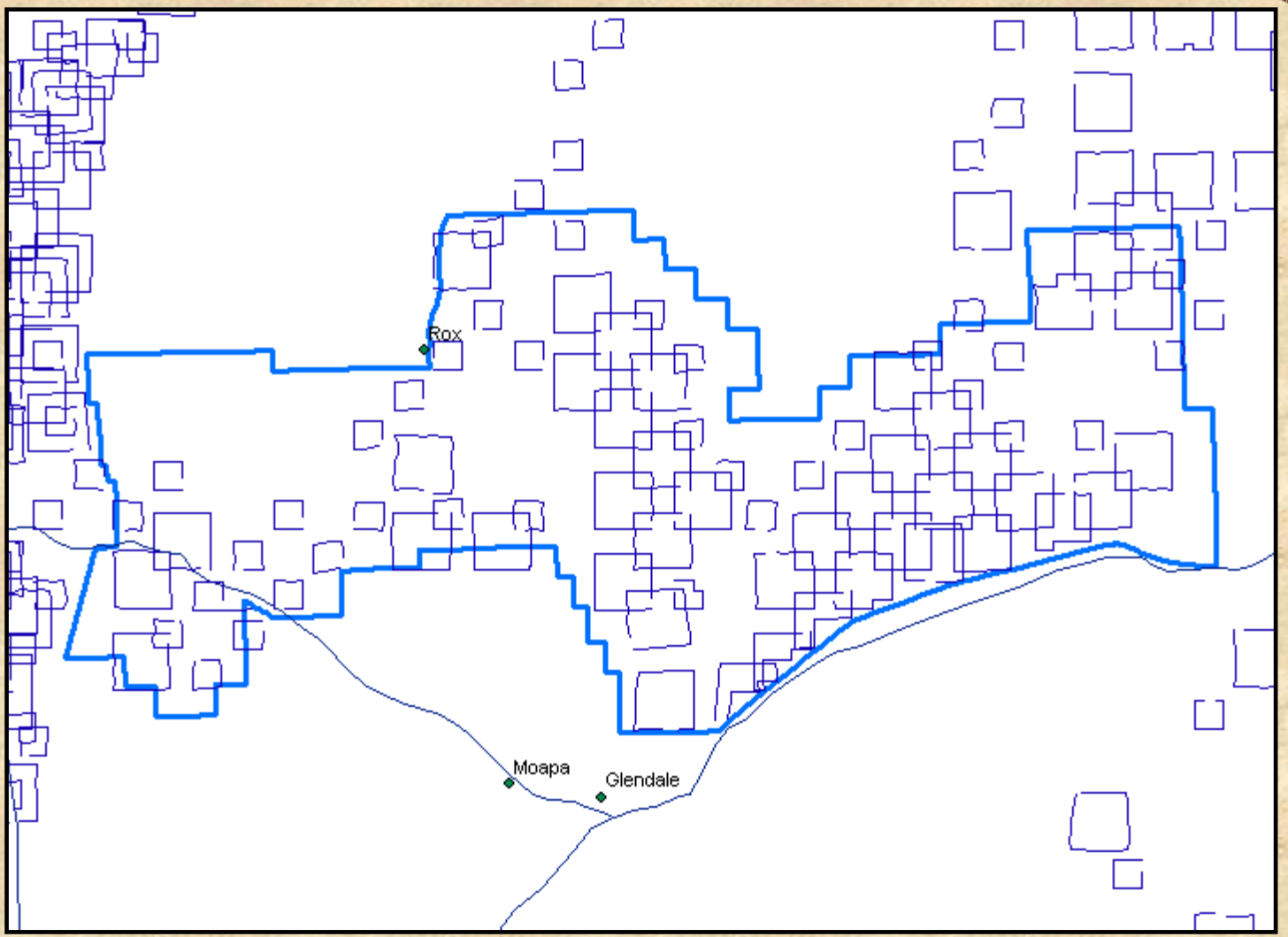
Mormon Mesa 2004

Assigned and Walked



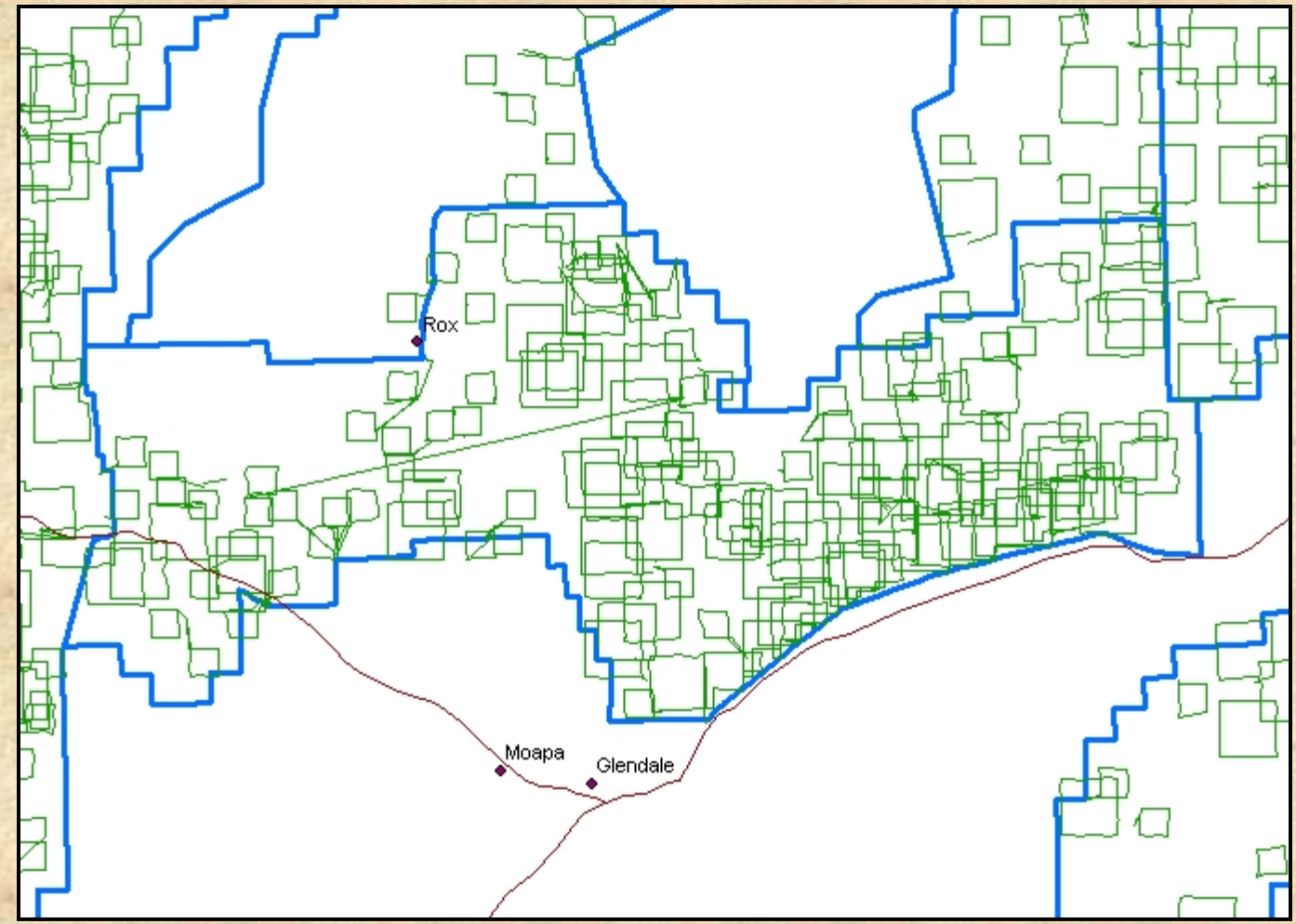
Mormon Mesa 2008

Walked



Mormon Mesa 2009

Walked

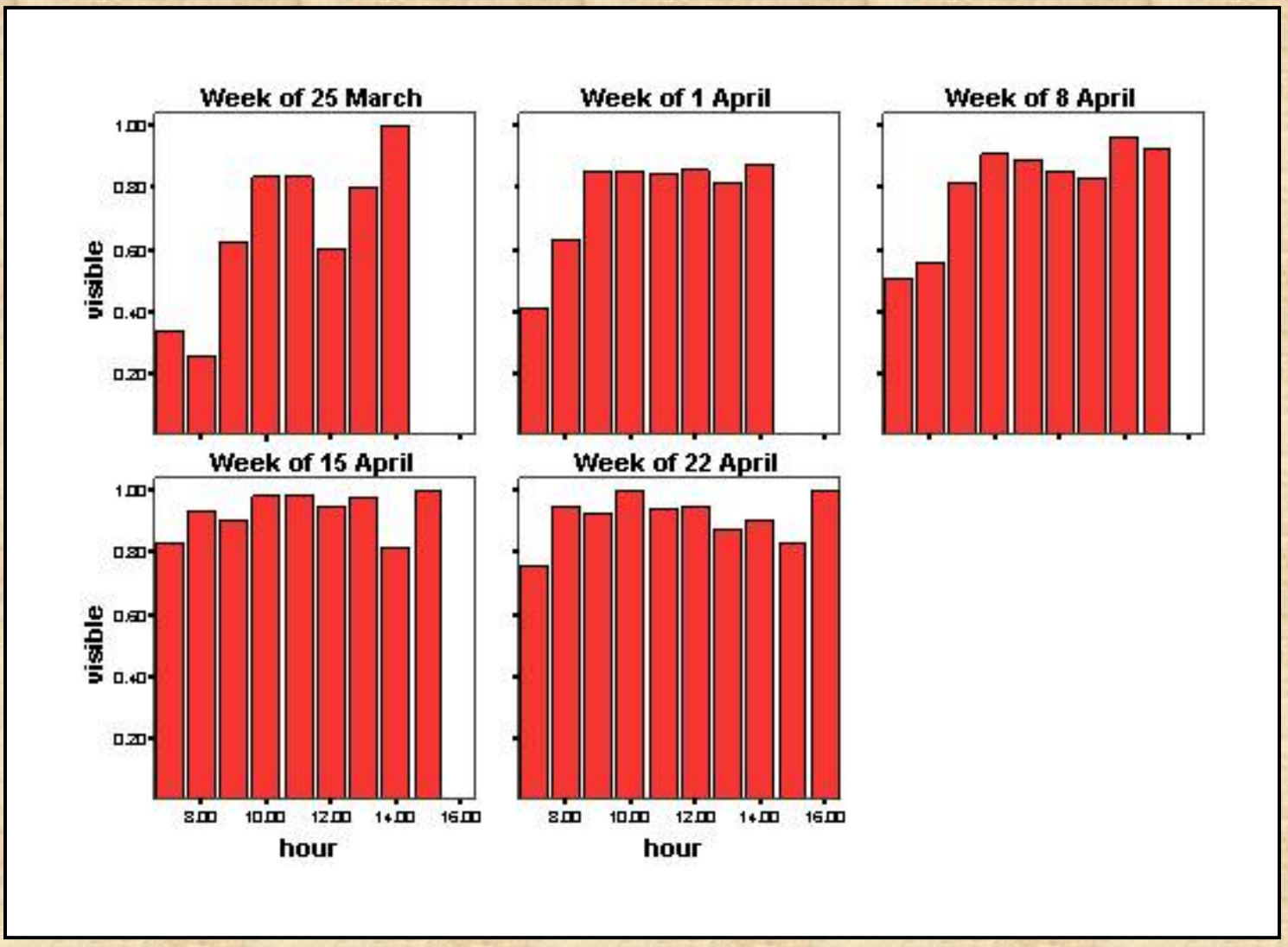


Access in Roadless Areas

- Planning routes into difficult areas is time intensive
- Repeating transects from past years allows us to build on past-year experience
- In 2007, we first collected paper data on transect access and completion
- In 2008, moved to electronic format and used staging sites to carry in water and supplies to crews away from roads
- In 2009, we developed a separate database for GBI and crews range-wide so they could report back to us about the transects they didn't walk at all

Goal 2: Improve effectiveness

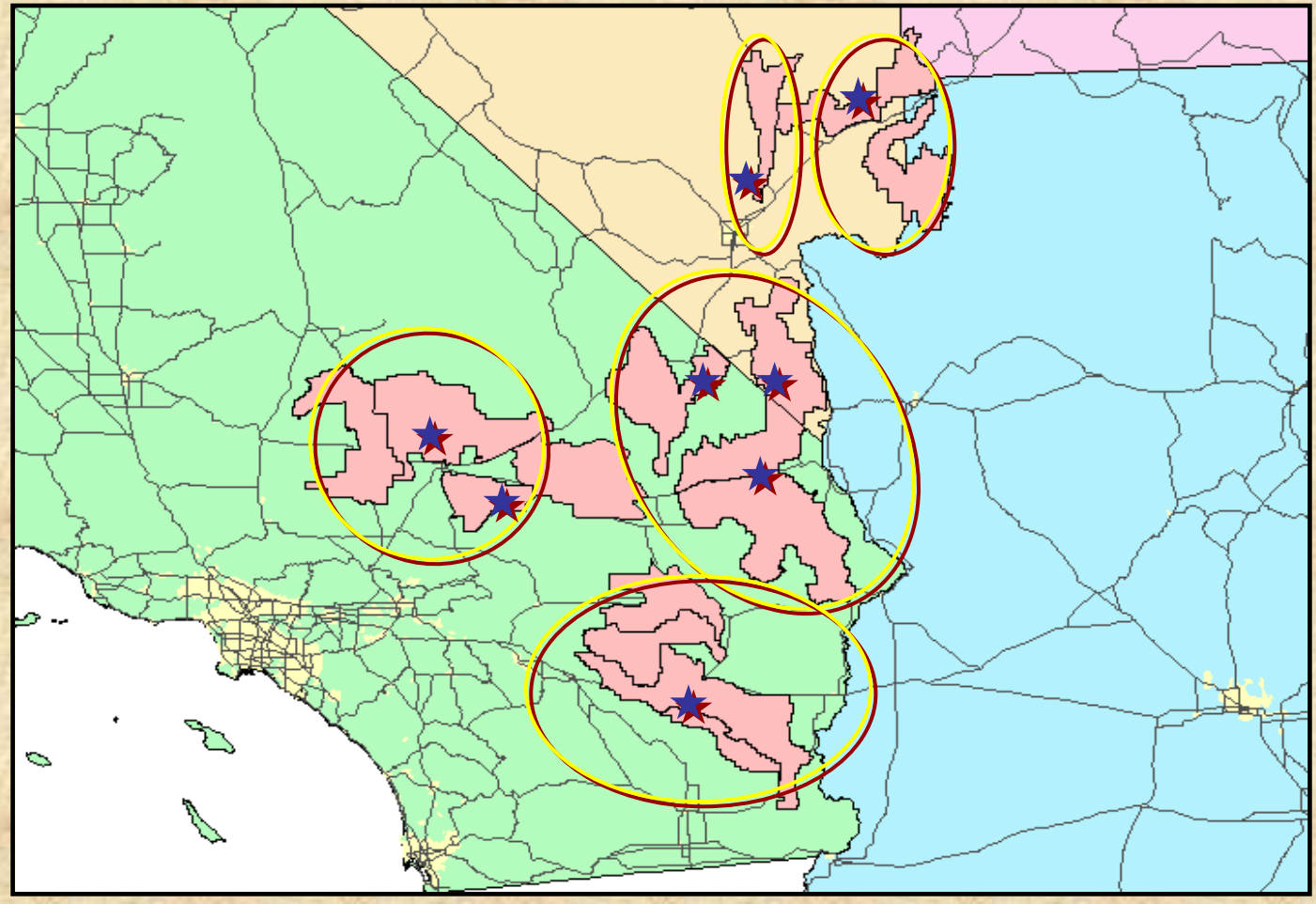
5 weeks of tortoise activity



Transect Completion by Area

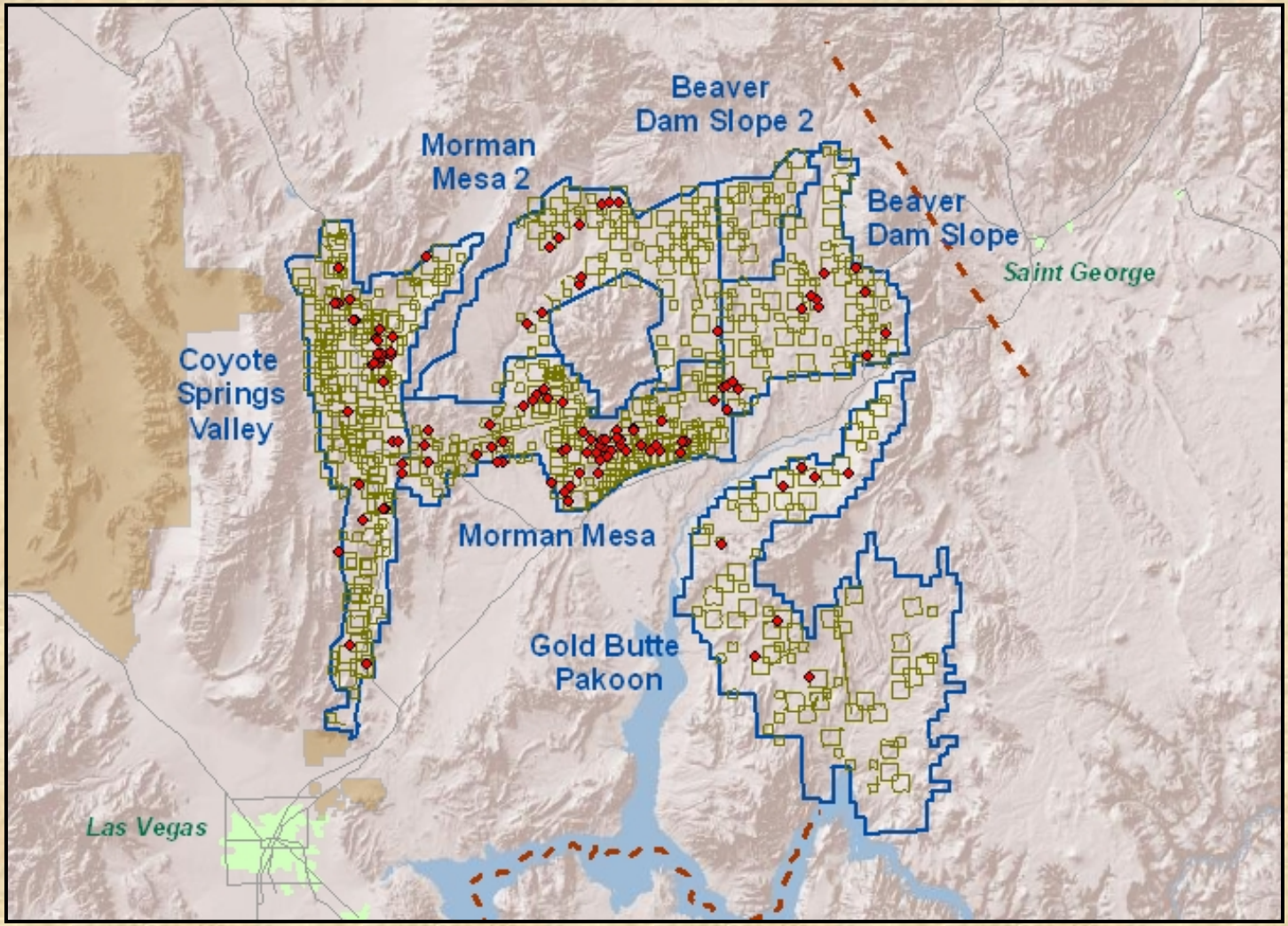
Transects completed in one window of time

Tortoise above-ground activity monitoring area



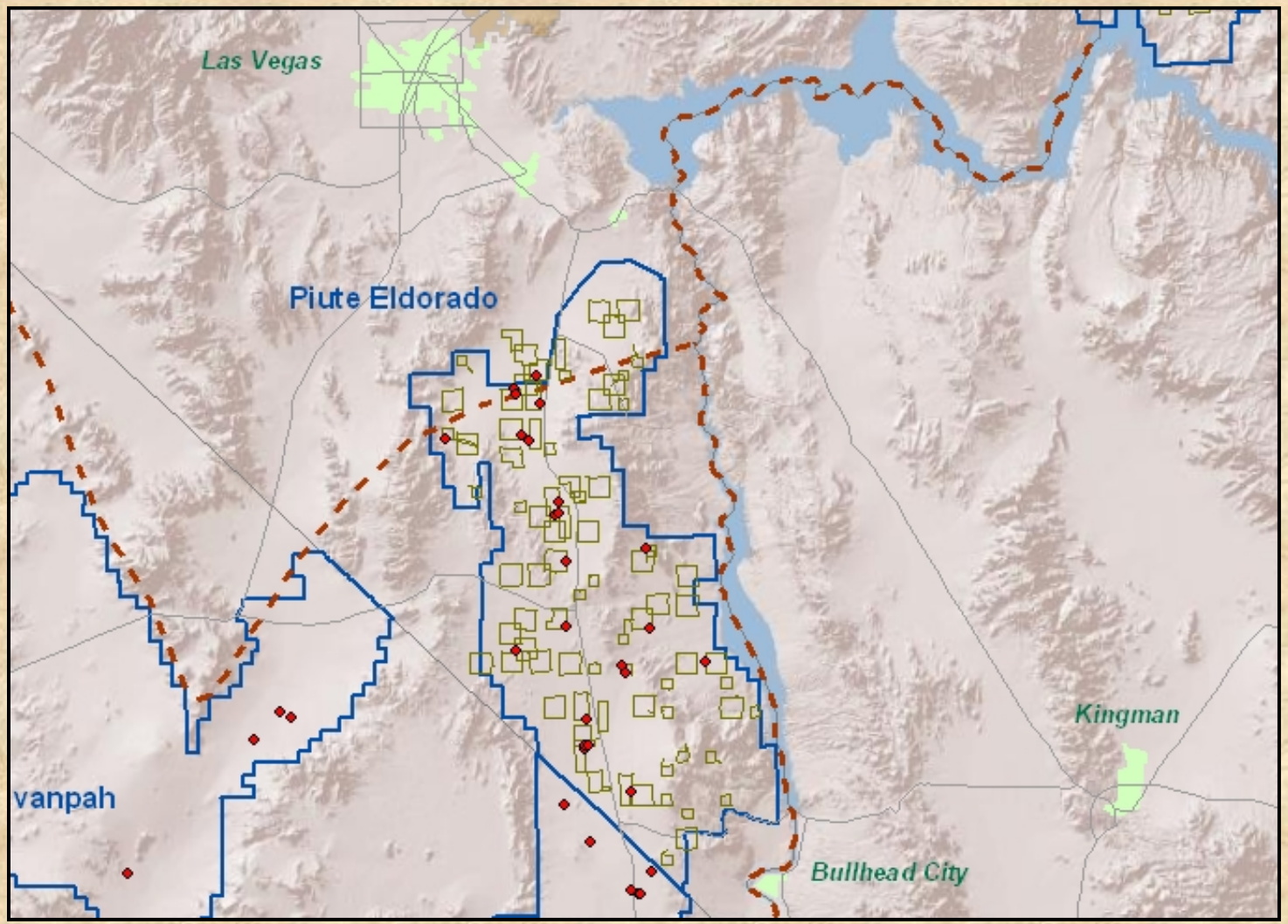
Transects and tortoises 2009

Northeastern Mojave



Transects and tortoises 2009

Piute-Eldorado Valleys



Transects Completed
2005 - 2009

Recovery Unit	Monitoring Stratum	2005	2007	2008	2009
Target precision		No target	28	21	21
Precision achieved		32.2	26.5	No est.	No est.
Northeast Mojave	Beaver Dam Slope	50	53	32	69
	Coyote Springs Valley	26	88	83*	155
	Gold Butte/Pakoon	64	37	40	77
	Mormon Mesa	47	62	74	141
Eastern Mojave	Piute-Eldorado	80	46	134	82
Total		287	286	363*	524

* Another 80 transects were funded by a separate project

Completed Deliverables/Milestones 2009

- Contract mobilization
- Data Management Plan
- Pre-Season Planning Meeting (January)
- Development of Monitoring Handbook
- All permits in place
- Training of field monitors
- Monitoring season
- Post-Field Season Debriefing

Progress on Goals

- Provide specialized training of field crews
  - **Training program continued to focus on weakest areas identified after previous season debriefing**
- Adaptively identify any techniques to improve effectiveness and/or cost of tortoise monitoring
- Establish a baseline tortoise density estimate for later evaluation of recovery activities

Progress on Goals

- Provide specialized training of field crews
- Adaptively identify any techniques to improve effectiveness and/or cost of tortoise monitoring
  - **Added third available telemetry site in Clark County**
  - **Continued to update transect numbers based on most recent encounter rates for tortoises per kilometer**
- Establish a baseline tortoise density estimate for later evaluation of recovery activities

Progress on Goals

- Provide specialized training of field crews
- Adaptively identify any techniques to improve effectiveness and/or cost of tortoise monitoring
- Establish a baseline tortoise density estimate for later evaluation of recovery activities
  - **Developed new reporting format in the 2007 FWS Annual Report addressing requests of cooperators, e.g. stratum level density estimates**
  - **Data for Coyote Springs baseline created in 2008, for burned/unburned comparison in 2008 and 2009**

Work Plan for Project Completion

- Final QAQC before data analysis
  - We are approximately 3 weeks ahead of schedule due to drastic reduction in errors (1/3 the number in 2008).
- 2009 spatial and aspatial data products
  - Timing also benefits from reduced number of errors
- Final project report and biennium reporting materials
  - Due 31 December

How Future Related Projects Will Be Affected

- Full-team field season debriefings each year
- Data management planning involving all levels of data handlers
- Objective-driven training – training and competency can be evaluated
- Potential to integrate annual research projects
- Transect layout carries over year to year to improve access planning

Benefits of Participating in the Range-wide Monitoring Effort

- **Interstate, interagency cooperators – the Management Oversight Group – adopted this approach in 2001**
- **Designed for desert tortoises (Anderson and Burnham 1996)**
- **Body of experience for**
  - **field data collection**
  - **independent quality control**
  - **database management**
  - **analysis**
- **2001-2005 data (USFWS 2006) and later provide a context**
- **Coordination**