Thank you for signing in early

The webinar will begin promptly at
12:00 pm ET, 9:00 am PT

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SERDP and ESTCP Webinar Series

The webinar will begin promptly at 12:00 pm ET, 9:00 am PT

- You have two options for accessing the webinar
  1. Listen to the broadcast audio if your computer is equipped with speakers
  2. Call into the conference line: 303-248-0285
     Required conference ID: 6102000
- For any question or issues, please email serdp-estcp@noblis.org or call 571-372-6565

"Managing the Brown Treesnake Headache: Assessment of the Aerial Acetaminophen Bait Drop on Guam"

September 22, 2016

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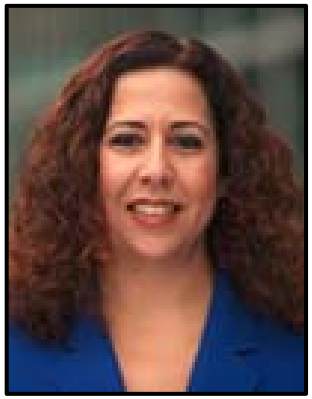
Welcome and Introductions



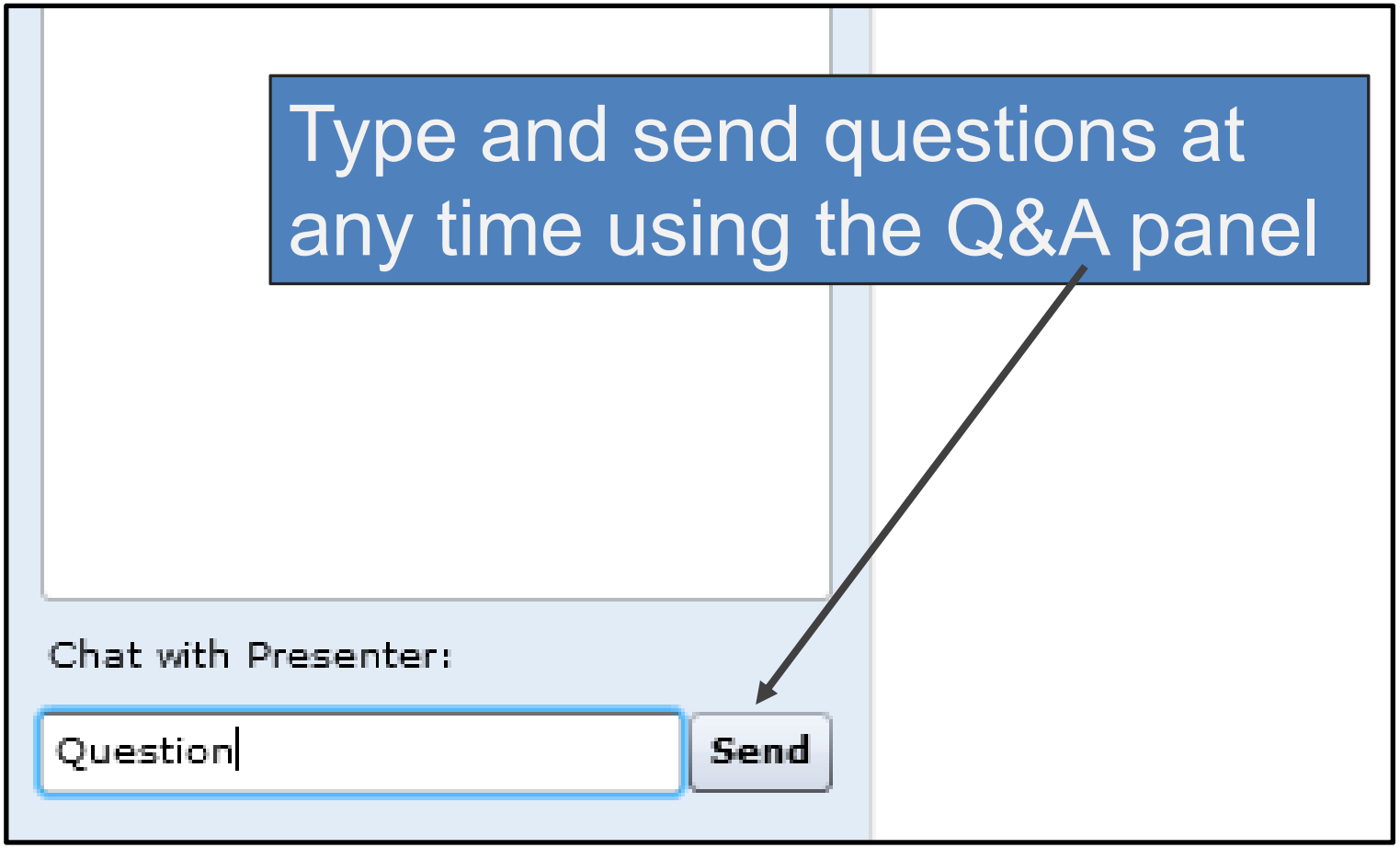
Rula A. Deeb, Ph.D.
Webinar Program Coordinator

SERDP DOD • EPA • DOE | ESTCP

Agenda

- **Webinar Logistics** (5 minutes)
  Dr. Rula Deeb, Geosyntec Consultants
- **Overview of SERDP and ESTCP** (5 minutes)
  Dr. Robin Nissan, SERDP and ESTCP
- **Managing the Brown Treesnake Headache: Assessment of the Aerial Acetaminophen Bait Drop on Guam** (55 minutes + Q&A)
  Dr. Brian Dorr, U.S. Department of Agriculture, Wildlife Services, National Wildlife Research Center
- **Final Q&A session**

How to Ask Questions



In Case of Technical Difficulties

- Delays in the broadcast audio
  - Click the mute/connect button
  - Wait 3-5 seconds
  - Click the mute/connect button again
  - If delays continue, call into the conference line
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- Submit a question using the chat box

SERDP and ESTCP Overview

Robin Nissan, Ph.D.

SERDP and ESTCP, Weapons Systems and Platforms Program Manager

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SERDP

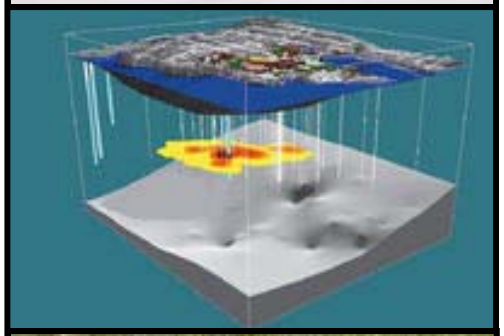
- Strategic Environmental Research and Development Program
- Established by Congress in FY 1991
  - DoD, DOE and EPA partnership
- SERDP is a requirements driven program which identifies high-priority environmental science and technology investment opportunities that address DoD requirements
  - Advanced technology development to address near term needs
  - Fundamental research to impact real world environmental management

ESTCP

- Environmental Security Technology Certification Program
- Demonstrate innovative cost-effective environmental and energy technologies
  - Capitalize on past investments
  - Transition technology out of the lab
- Promote implementation
  - Facilitate regulatory acceptance

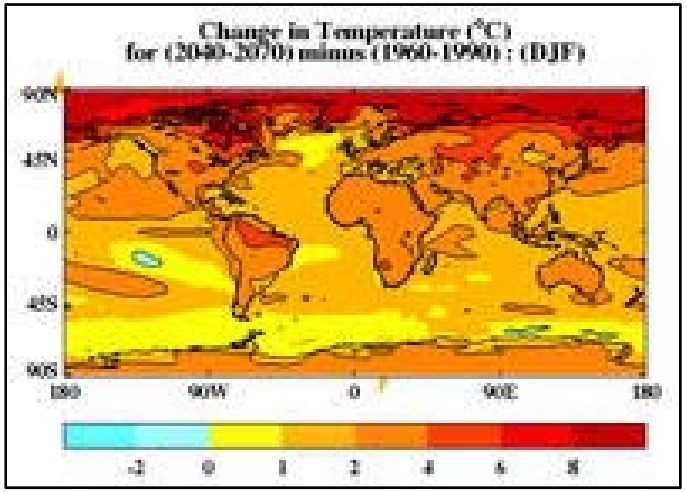
Program Areas

1. Energy and water
2. Environmental restoration
3. Munitions response
4. Resource conservation and climate change
5. Weapons systems and platforms



Resource Conservation and Climate Change

- Natural resources
  - Ecological forestry
  - Arid lands ecology and management
  - Cold regions ecology and management
  - Pacific island ecology and management
  - Coastal and estuarine ecology and management
  - Living marine resources ecology and management
  - Species ecology and management
  - Watershed processes and management
- Climate change
  - Vulnerability and impact assessment
  - Adaptation science
  - Land use and carbon management
- Air quality
  - Fugitive dust
  - Fire emissions



SERDP and ESTCP Webinar Series

Date	Topic
October 6, 2016	Cyber Security Requirements and Impacts on Installation Energy Systems
October 20, 2016	DoD Decision Making and Climate Change
November 3, 2016	Environmental Restoration
November 17, 2016	Weapons Systems and Platforms
December 15, 2016	Environmental Restoration

SERDP & ESTCP Webinar Series

http://serdp-estcp.org/Tools-and-Training/Webinar-Series

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Managing the Brown Treesnake Headache: Assessment of the Aerial Acetaminophen Bait Drop on Guam

Brian S. Dorr, Ph.D.
USDA Wildlife Services
National Wildlife Research Center

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Agenda

- Background on brown treesnakes
- Aerial bait drop technology development
- Technology objectives and approach
- Results of the demonstration project
- What did we learn?
  - Relevance
  - Applications
- Future directions

Brown Treesnake (*Boiga irregularis*)

- Accidentally introduced
- Damages
  - Ecological
  - Economic
  - Health and safety
- Control and interdiction

Current Control Methods

Current Control Methods (Cont'd)

- Targeted at critical areas and small scales
  - Preventing off island transfer
- Large scale (landscape) control needed
- Inaccessible forested areas
- Restoration

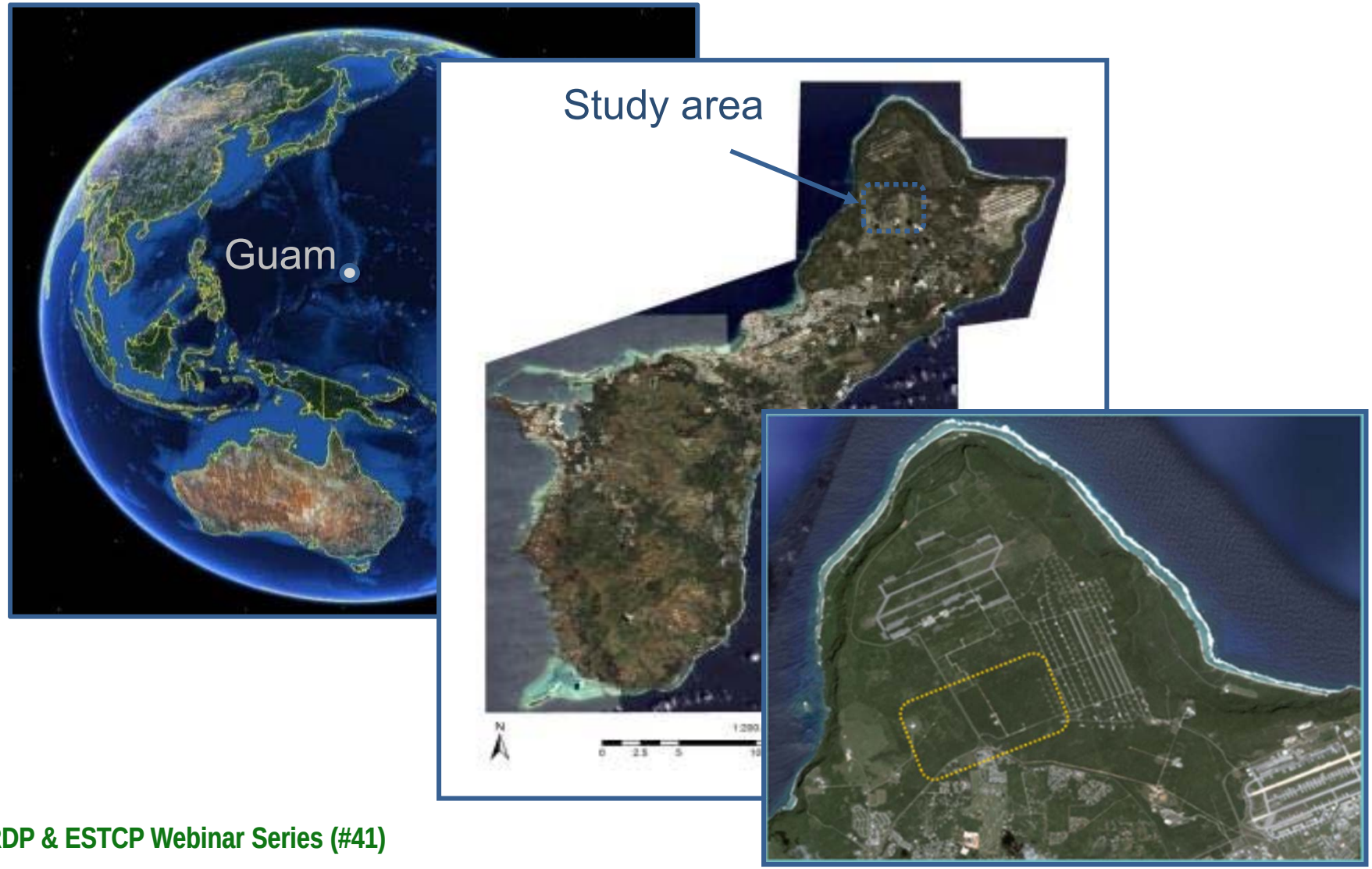
ESTCP Demonstration Project Goal

- Evaluate the aerial deployment of toxic baits to reduce brown treesnake (BTS) numbers in forests on Guam

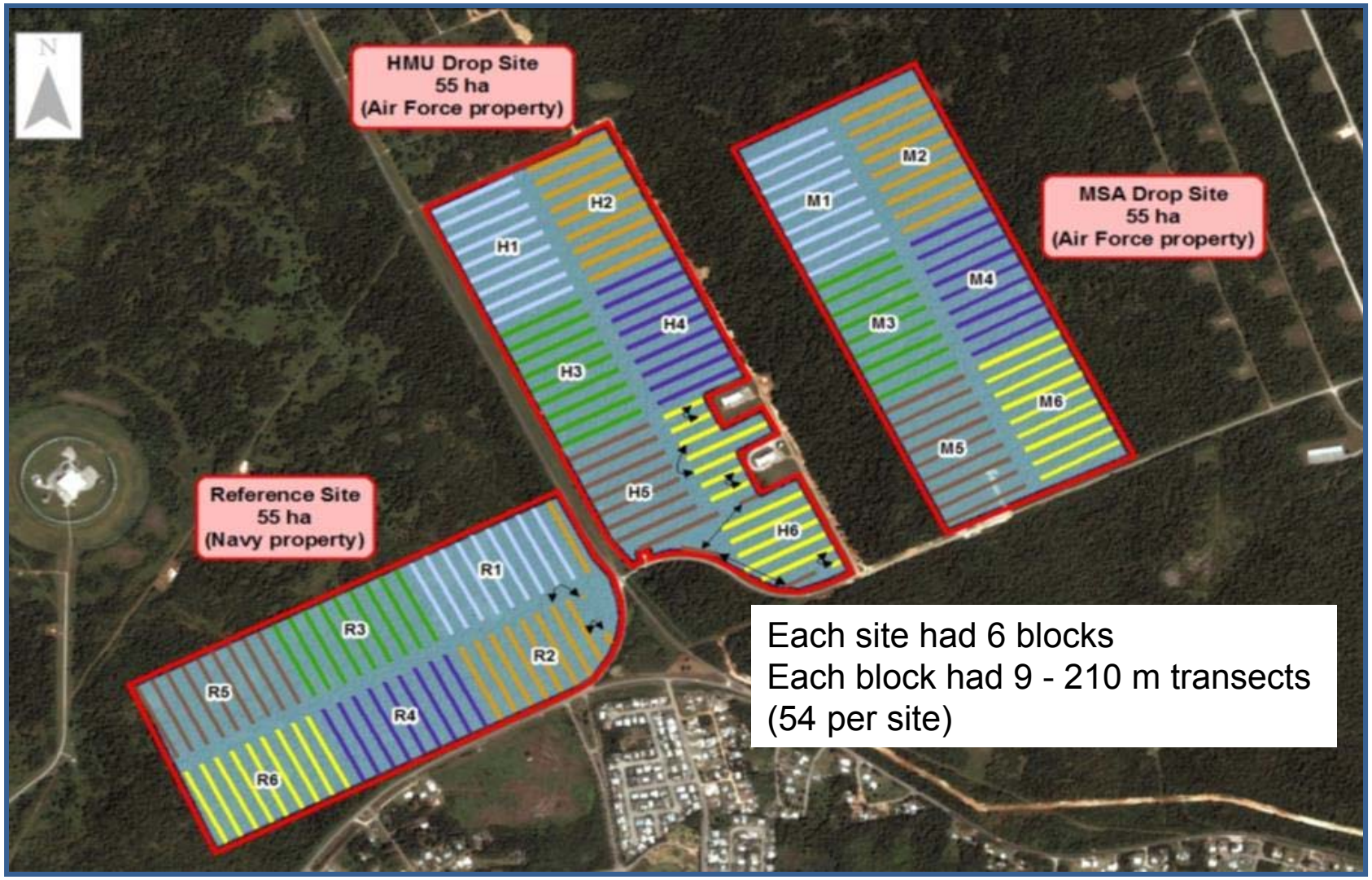
Performance Objectives

Performance Objective	Success Criteria
▪ Qualitative objectives	▪ Bait production and delivery
▪ Canopy landing of baits	▪ ≥80% baits in canopy
▪ Bait take rate and fate of radio marked baits	▪ ≤5 deployments needed for reducing treated bait take >80%
▪ Monitoring of BTS activity • H_o: No change post-drop or vs control	▪ <5 Deployments to maintain BTS bait take at <30% ▪ Declines ($p<0.05$) pre-post and ref
▪ Rodent activity • Ho: No change post bait drop or vs control	▪ ≤ 20% increase, No ($p<0.05$) increase pre-post and vs ref site
▪ Non-target impacts	▪ ≤ 10% bait take

Study Area



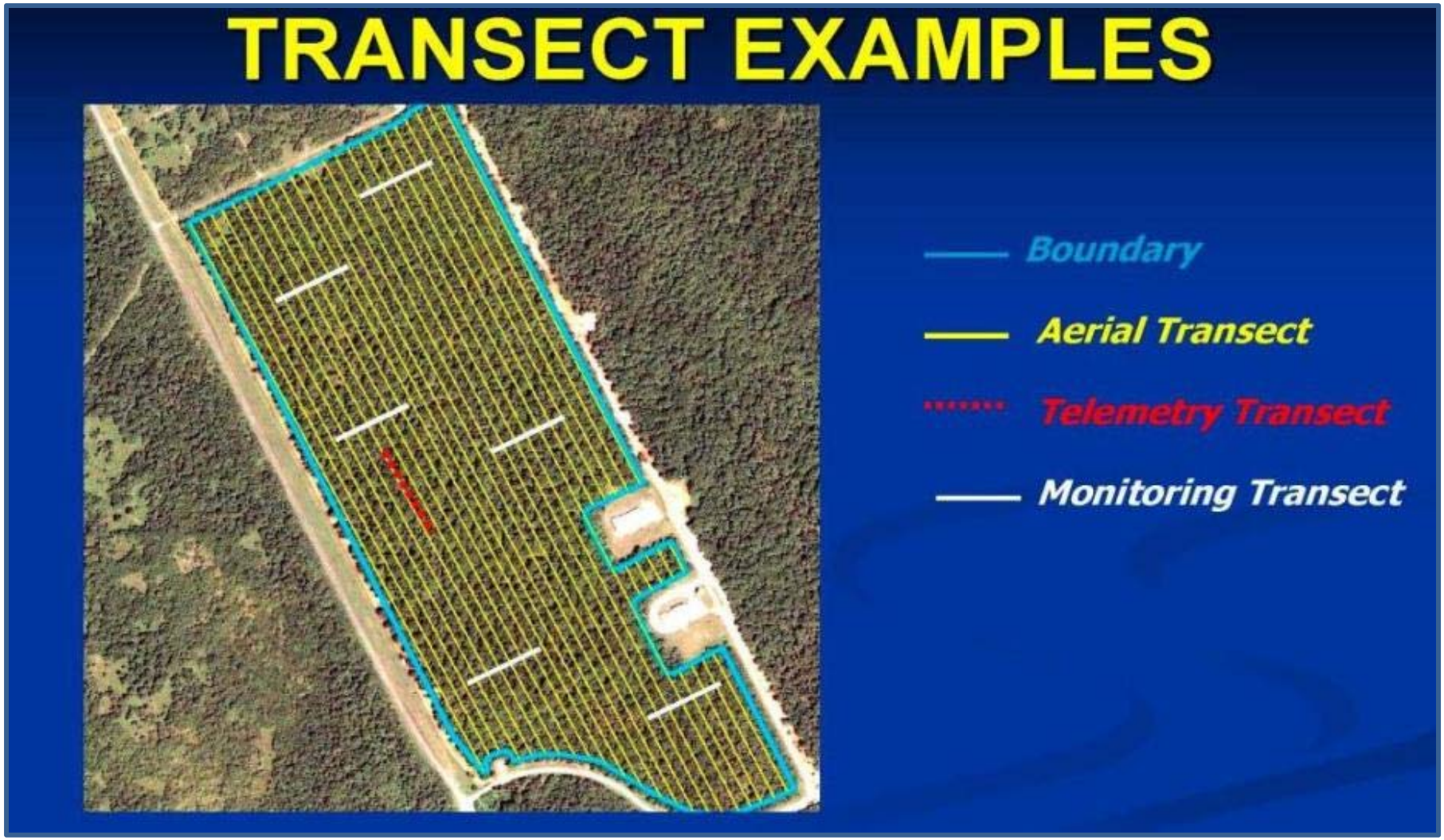
Technology Approach



Each site had 6 blocks
Each block had 9 - 210 m transects
(54 per site)

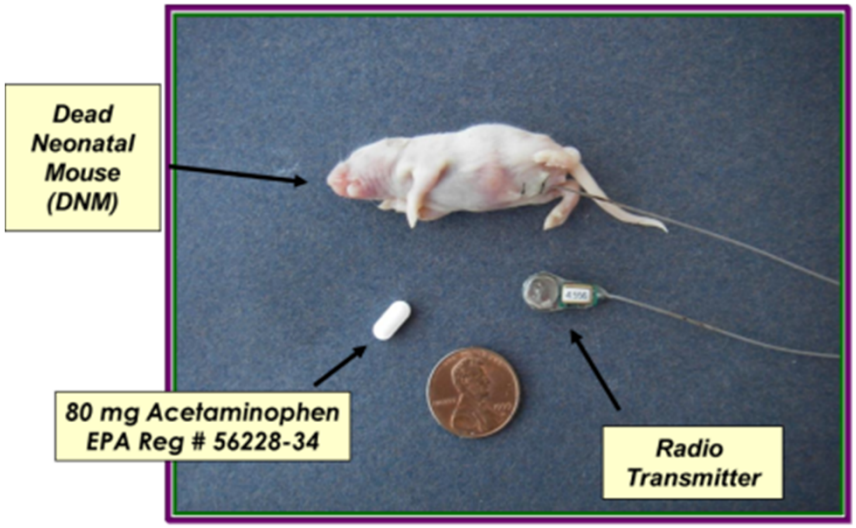
Technology Approach
HMU: Habitat Management Unit

Technology Approach



Technology Approach

- Dead Neonatal Mouse (DNM)
  - 80 mg acetaminophen inserted
    - NWRC produces and holds EPA registration
  - Subset of 10/site/drop marked with radio transmitters



Technology Approach

- Flagger and bait assembly

Technology Approach

- Snake monitoring
- ~Every 2 weeks
- Randomly selected 6 transects/site
  - 66 bait stations/site/ session (11 stations/ transect)
- Baited/checked 48 hrs

Technology Approach

- Rodent monitoring
- Quarterly monitoring on random transects
  - 132 trap nights/session/site
  - Pre-baited with shredded coconut
  - Modified Tomahawk traps

Analyses

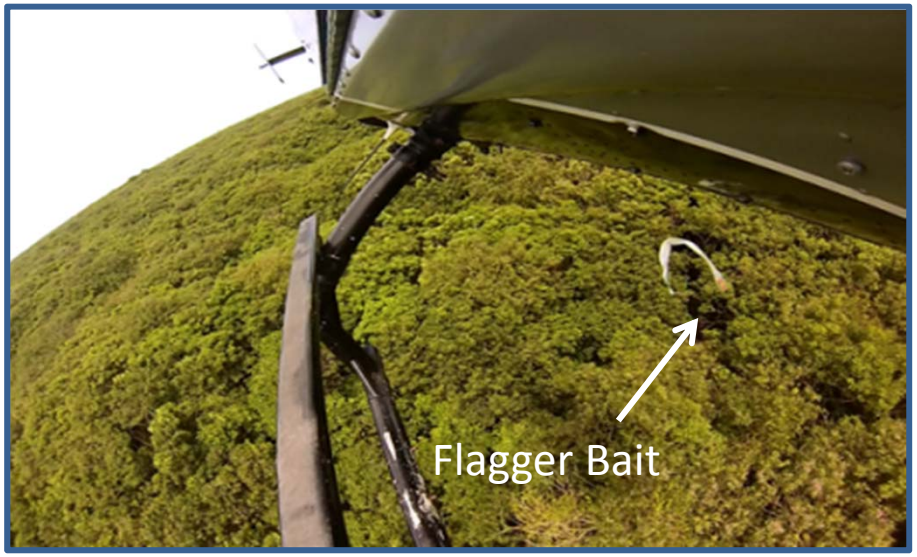
- Canopy landing of radio marked baits
  - Between sites (T-test)
- Bait station monitoring
- General linear model ANOVA; main effects; treatment, location and time
- A priori contrasts for treatment x time interaction
- Tukey-Kramer adjustment multiple comparisons

MEDIA (VIDEO)

Q&A Session 1

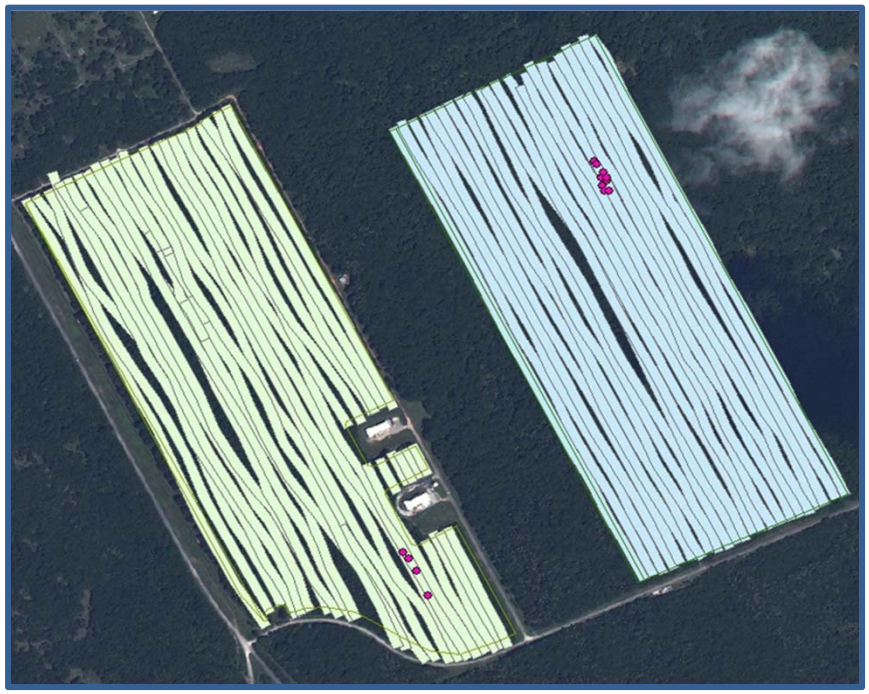
Results: Bait Delivery

- 15 bait applications (09/2013 – 12/2014)
- 29,700 treated baits applied
- N = 1,980/ site (36/ha)



Results: Bait Delivery (Cont'd)

- Radio marked baits
- 84% in canopy overall (N-105)
  - Between sites t9 = 0.60, p=0.54
- Mean canopy height = 12.1 m
- Mean distance between baits = 19.3 m

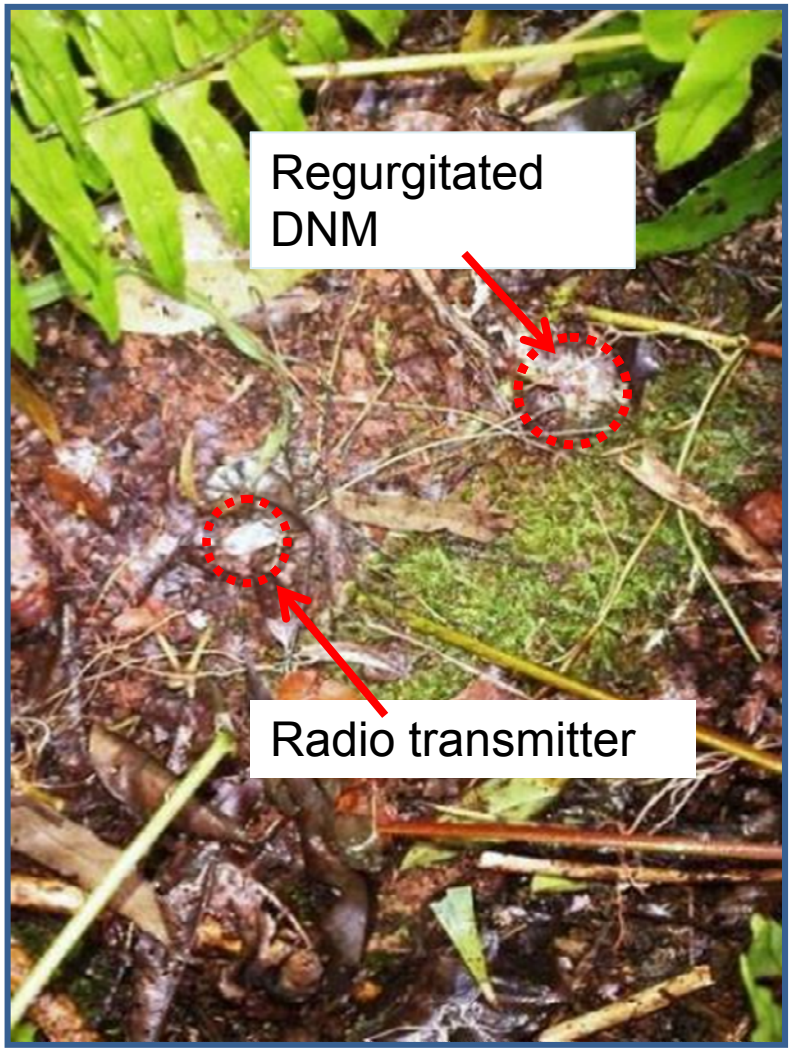


Results: Bait Fate

- 95% (N = 110) Radio recovery rate
  - 1 BTS with radio
  - 2 non-targets recovered
    - 1 Invasive cane toad
    - <1% of radio marked baits
    - 1 juvenile monitor lizard

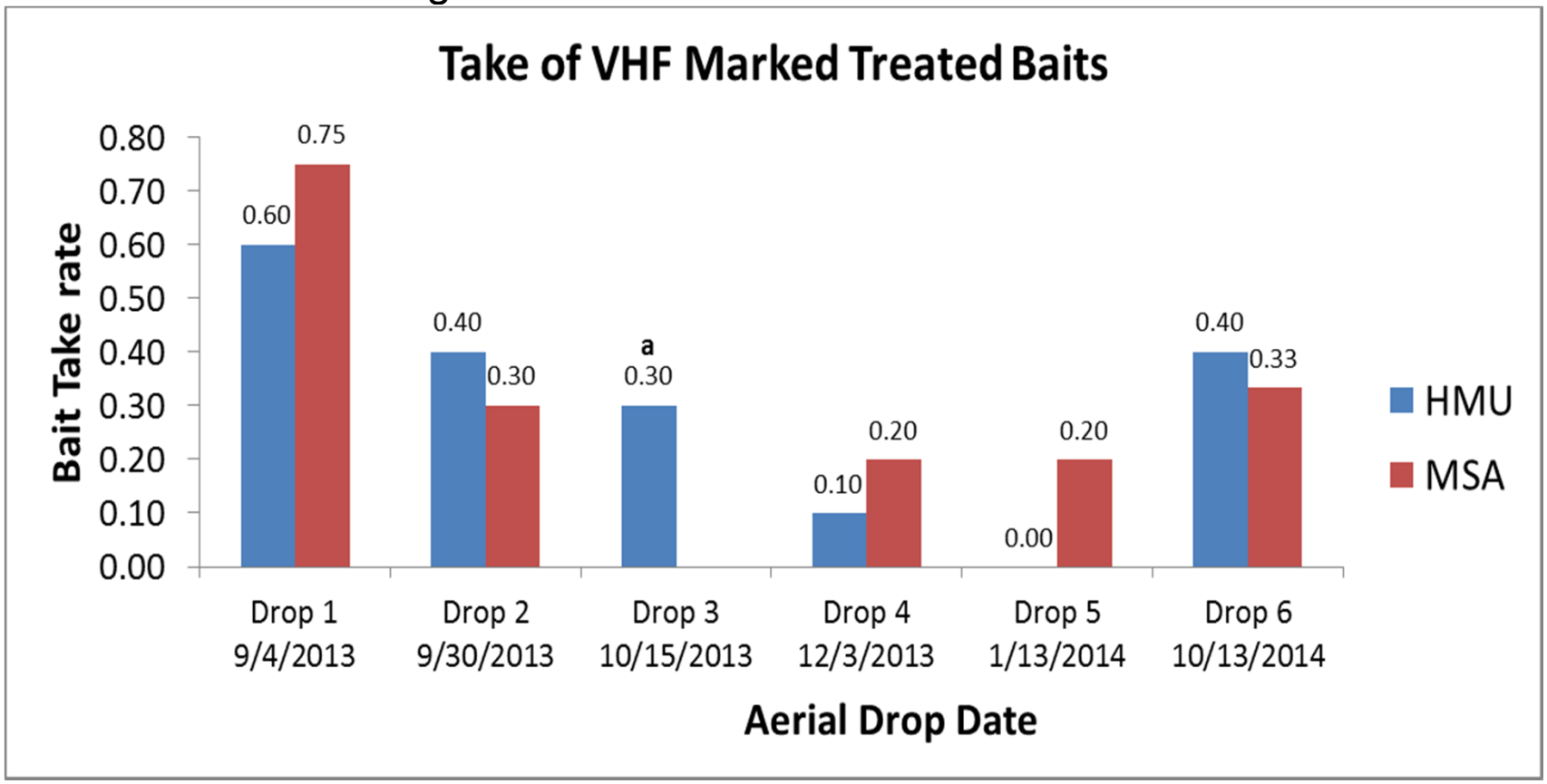
Results: Radio Marked Baits

- Snakes regurgitating baits
  - Some found near dead snakes
  - “Apparent take”: Observed in canopy, recovered on ground “clean”
- Opportunistic collection of dead snakes
  - Acetaminophen exposure
  - 83% (N = 3 ea. MSA and HMU)
  - None offsite (N = 8)



Results: Bait Take (Radio Marked Bait)

- HMU = On average 70% decline first 5 drops
- MSA = On average 69% decline



[a]Drop on HMU only, severe weather prevented drop on MSA site

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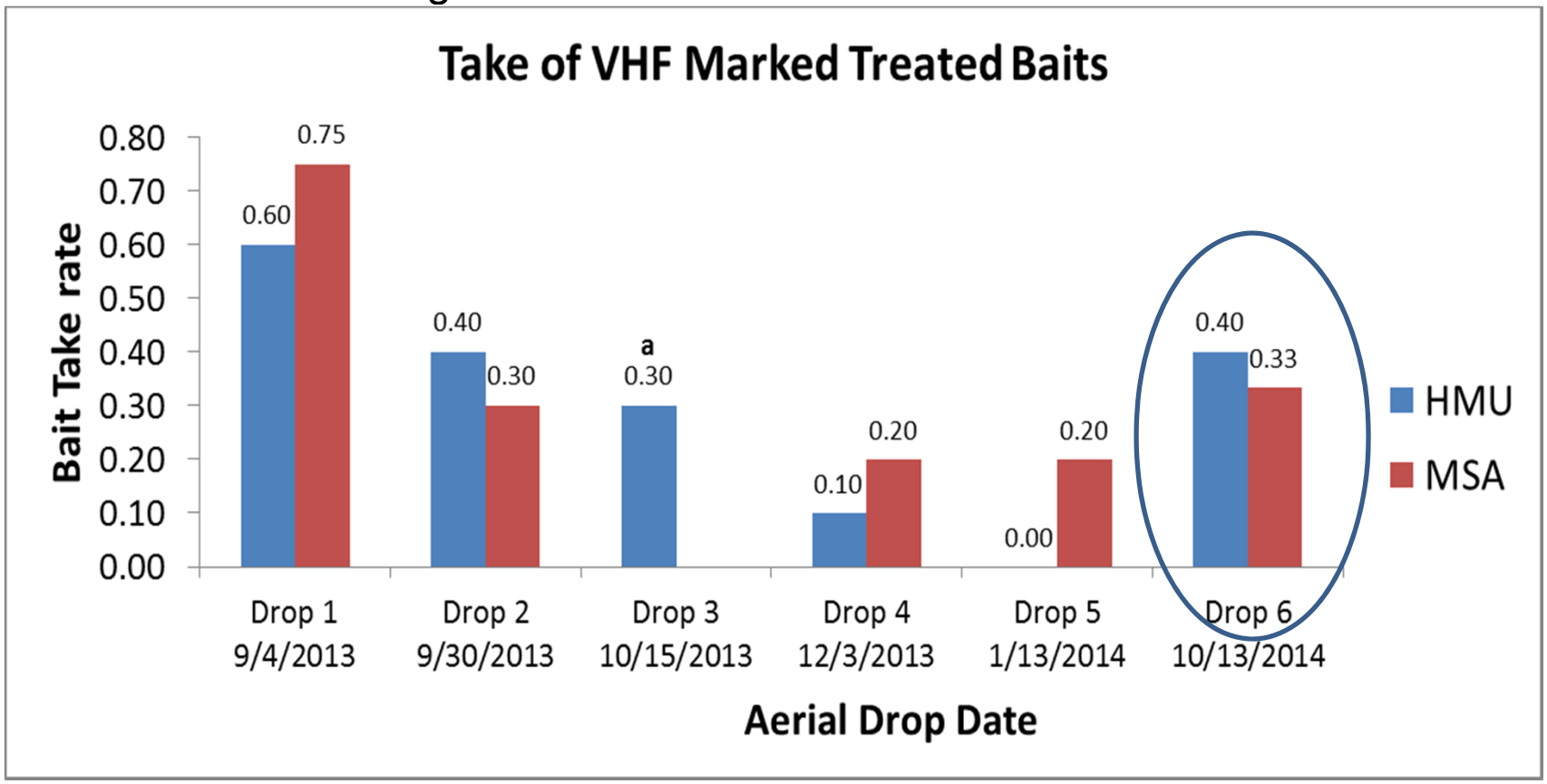
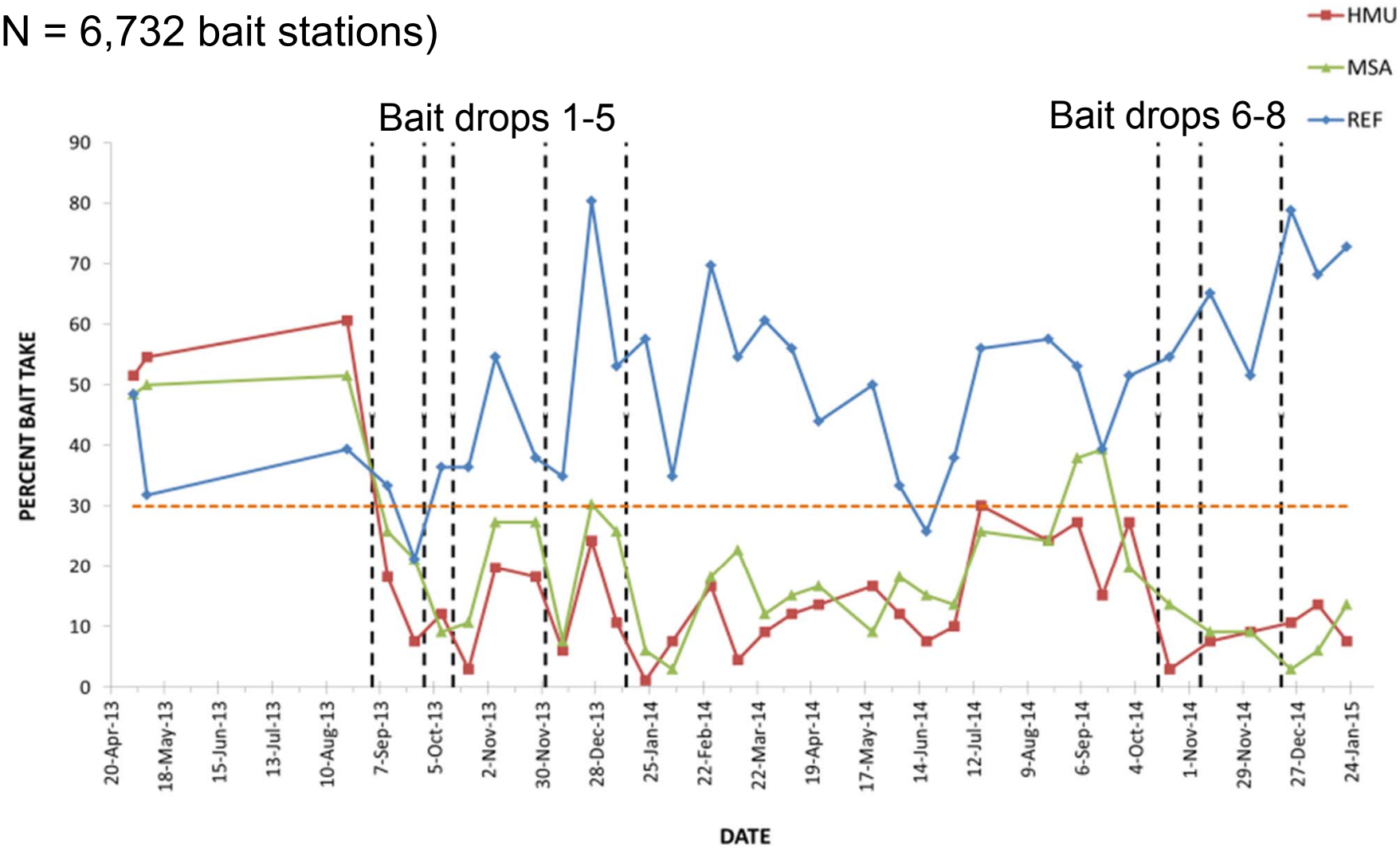


[a]Drop on HMU only, severe weather prevented drop on MSA site

Results: Effect on Snake Abundance

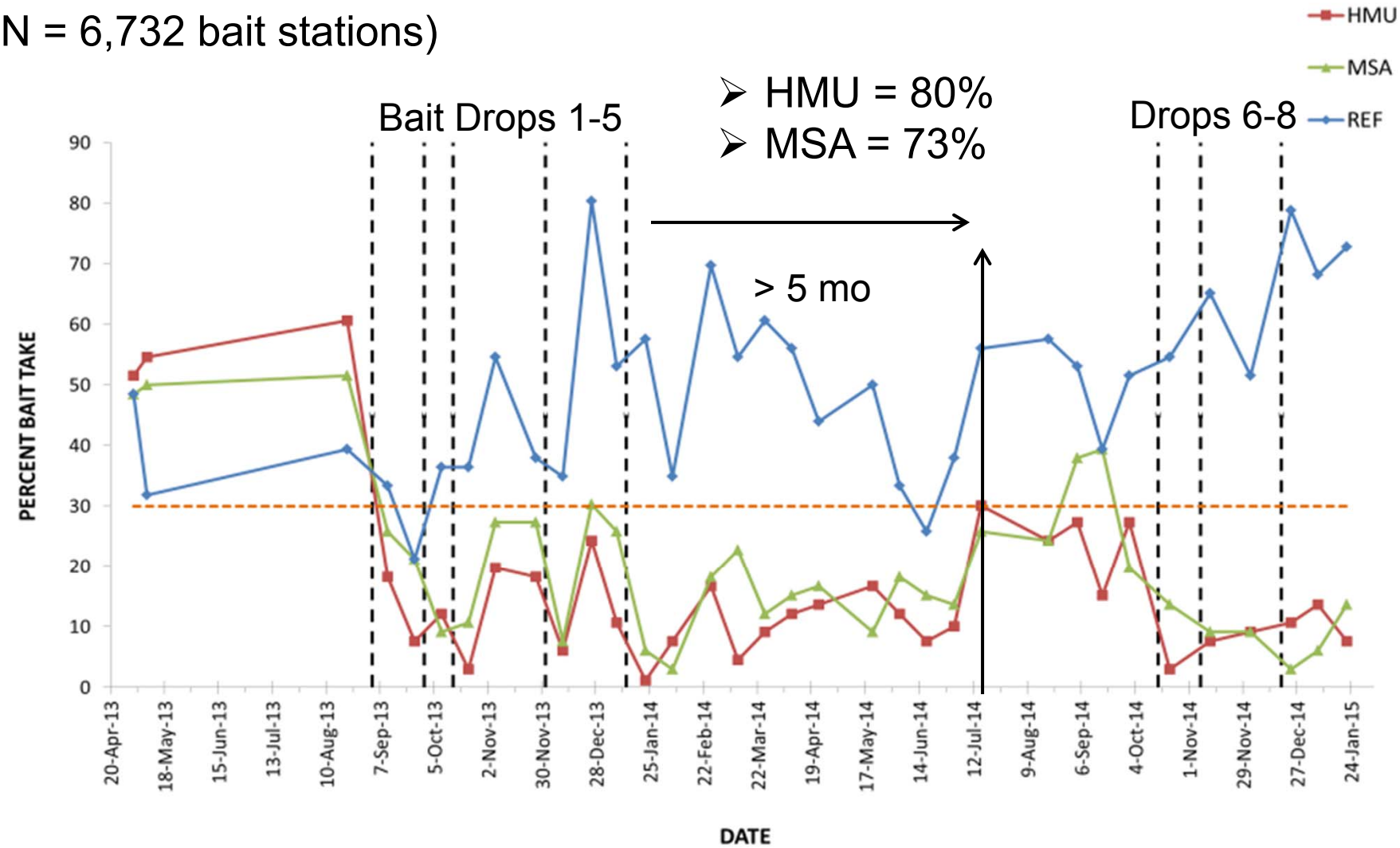
(N = 6,732 bait stations)



Results: Effect on Snake Abundance

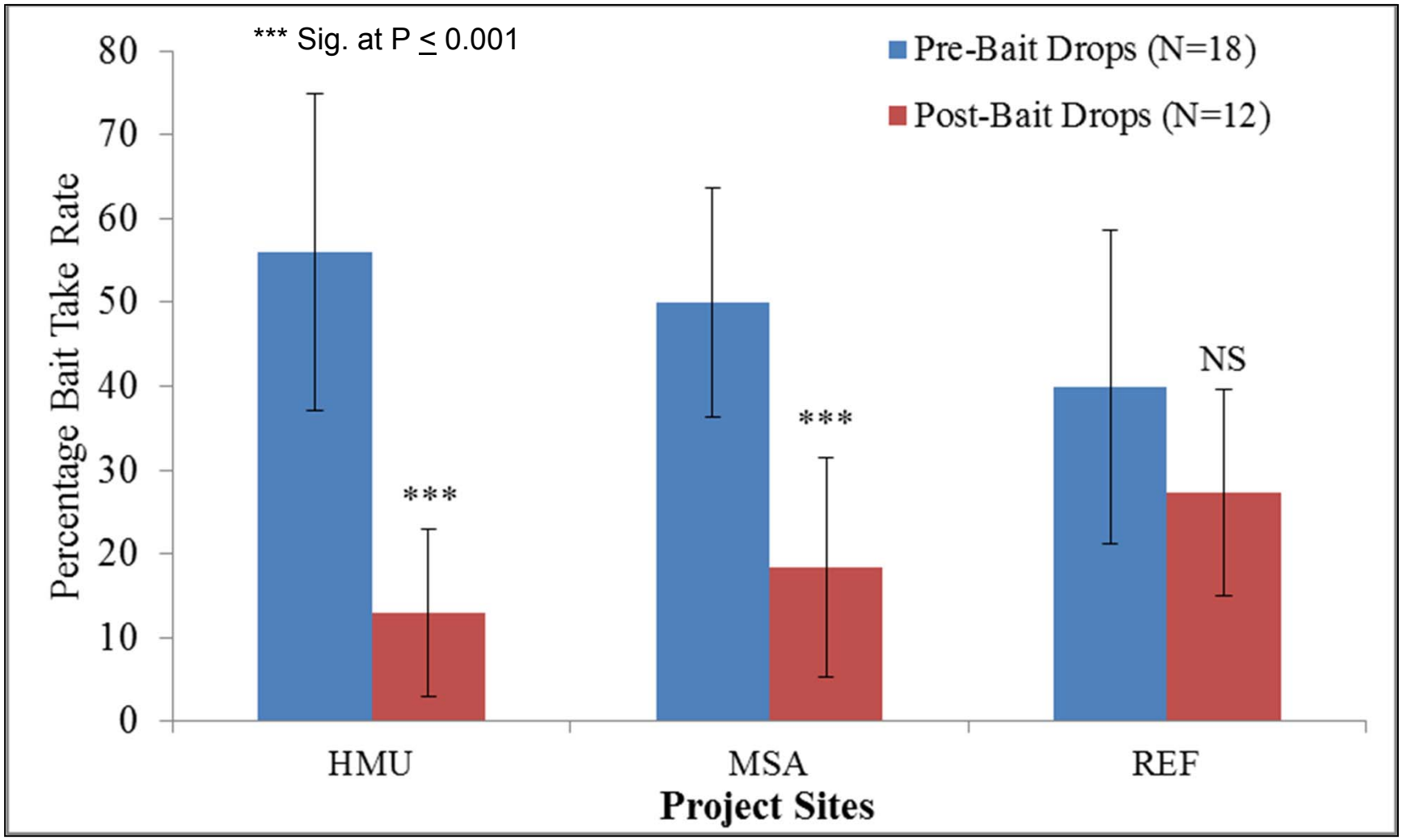
(N = 6,732 bait stations)

- HMU = 80%
- MSA = 73%



Results: Effect on Snake Numbers

Pre- and post-bait take rate within sites after 1st bait drop



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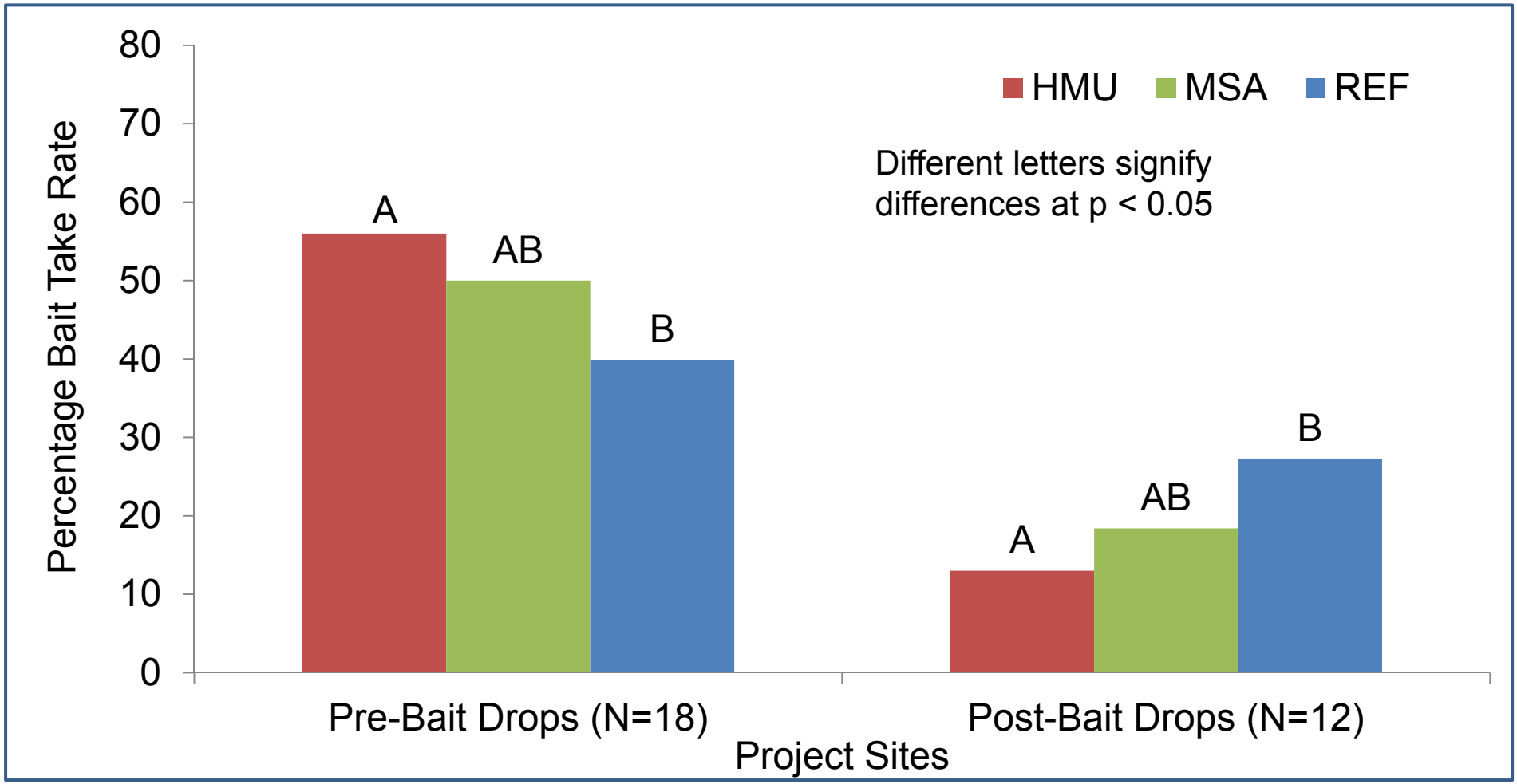
Pre- and post-bait take rate between sites after 1st bait drop



Results: Effect on Snake Numbers Drops 1-5

Pre- and post drop comparisons between bait take rate for bait drops 1-5

	Least Squared Means (LSM) for Effect Drop*Location H_0: LSMean(i)=LSMean(j) / Pr > |t|															
		HMU	MSA	REF	HMU	MSA	REF	HMU	MSA	REF	HMU	MSA	REF	HMU	MSA	REF
	i/j	Drop 1	Drop 1	Drop 1	Drop 2	Drop 2	Drop 2	Drop 3	Drop 3	Drop 3	Drop 4	Drop 4	Drop 4	Drop 5	Drop 5	Drop 5
HMU	Pre-drop	7.15	5.37	4.74	5.75	6.16	2.54	7.85	6.34	2.37	7.85	6.43	-0.09	10.65	9.84	1.85
		<.01	<.01	<.01	<.01	<.01	0.50	<.01	<.01	0.63	<.01	<.01	1.00	<.01	<.01	0.93
MSA	Pre-drop	6.22	4.44	3.81	5.02	5.42	1.81	6.81	5.30	1.32	6.81	5.39	-1.14	9.35	8.54	0.55
		<.01	<.01	0.02	<.01	<.01	0.94	<.01	<.01	1.00	<.01	<.01	1.00	<.01	<.01	1.00
REF	Pre-drop	4.53	2.75	2.12	3.68	4.08	0.47	4.92	3.41	-0.57	4.92	3.50	-3.03	6.98	6.17	-1.82
		<.01	0.35	0.81	0.03	0.01	1.00	<0.01	0.07	1.00	<0.01	0.05	0.19	<.01	<.01	0.94

Results: Effect on Snake Numbers Drops 1-5

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		<.01	0.35	0.81	0.03	0.01	1.00	<0.01	0.07	1.00	<0.01	0.05	0.19	<.01	<.01	0.94

Results: Effect on Snake Numbers Drops 6-8

Pre- and post drop comparisons between bait take rate for bait drops 6-8

	Least Squared Means (LSM) for Effect Drop*Location H_0: LSMean(i)=LSMean(j) / Pr > |t|									
		HMU	MSA	REF	HMU	MSA	REF	HMU	MSA	REF
	i/j	Drop 6	Drop 6	Drop6	Drop 7	Drop 7	Drop 7	Drop 8	Drop 8	Drop 8
HMU	Pre-drop	3.196	1.642	-4.350	3.167	3.022	-6.422	3.129	3.795	-10.630
		0.069	0.891	0.001	0.075	0.111	<.0001	0.083	0.011	<.0001
MSA	Pre-drop	3.862	2.308	-3.684	4.039	3.894	-5.550	4.128	4.794	-9.632
		0.008	0.475	0.015	0.004	0.007	<.0001	0.003	<0.001	<.0001
REF	Pre-drop	7.102	5.548	-0.444	8.281	8.136	-1.308	8.988	9.654	-4.771
		<.0001	<.0001	1.000	<.0001	<.0001	0.977	<.0001	<.0001	<.0001

Results: Effect on Snake Numbers Drops 6-8

Pre- and post drop comparisons between bait take rate for bait drops 6-8

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Pre- and post drop comparisons between bait take rate for bait drops 6-8

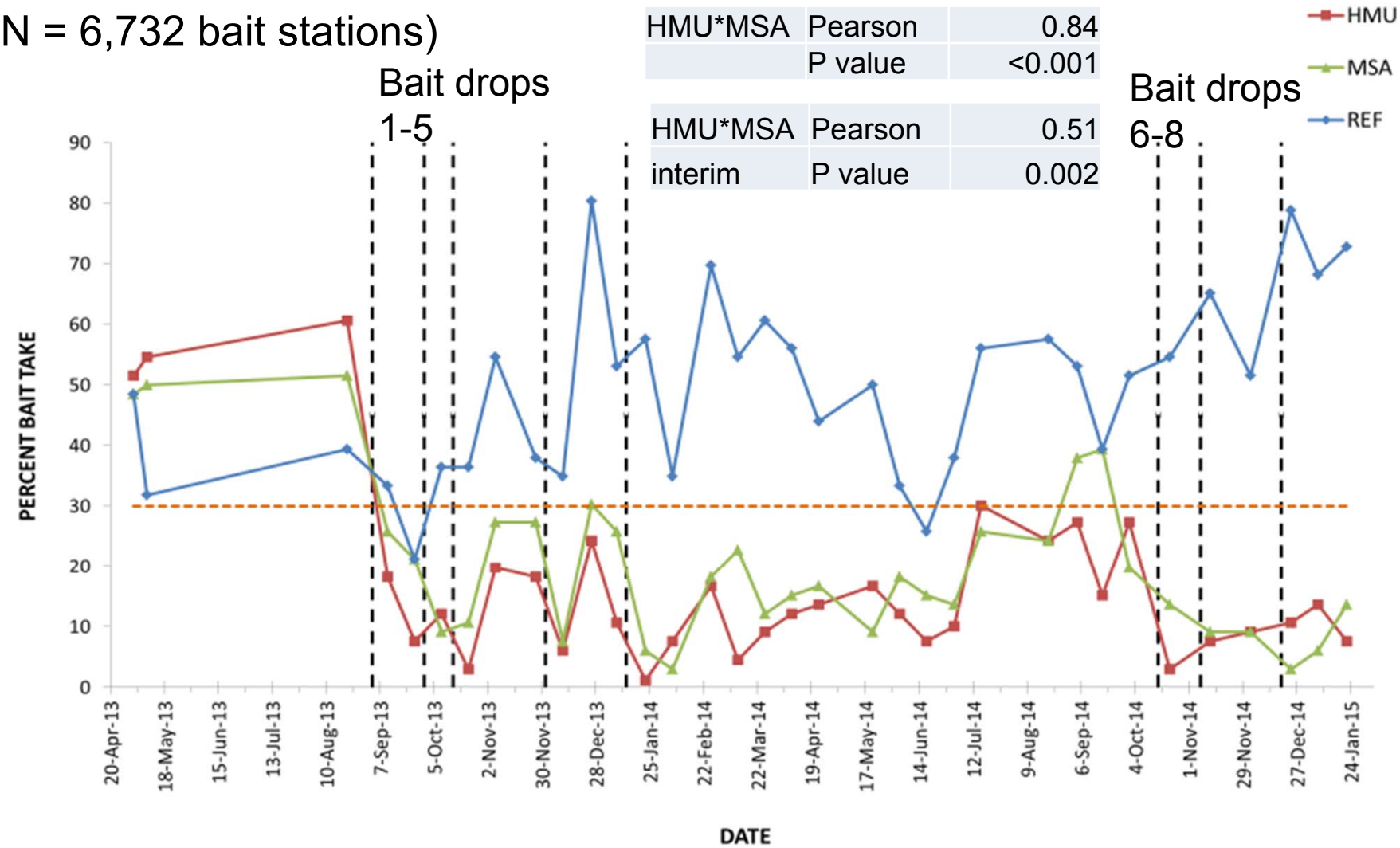
	Least Squared Means (LSM) for Effect Drop*Location H_0: LSMean(i)=LSMean(j) / Pr > |t|									
		HMU	MSA	REF	HMU	MSA	REF	HMU	MSA	REF
	i/j	Drop 6	Drop 6	Drop6	Drop 7	Drop 7	Drop 7	Drop 8	Drop 8	Drop 8
HMU	Pre-drop	3.196	1.642	-4.350	3.167	3.022	-6.422	3.129	3.795	-10.630
		0.069	0.891	0.001	0.075	0.111	<.0001	0.083	0.011	<.0001
MSA	Pre-drop	3.862	2.308	-3.684	4.039	3.894	-5.550	4.128	4.794	-9.632
		0.008	0.475	0.015	0.004	0.007	<.0001	0.003	<0.001	<.0001
REF	Pre-drop	7.102	5.548	-0.444	8.281	8.136	-1.308	8.988	9.654	-4.771
		<.0001	<.0001	1.000	<.0001	<.0001	0.977	<.0001	<.0001	<.0001

Results: Effect on Snake Abundance

(N = 6,732 bait stations)

HMU*MSA	Pearson	0.84
	P value	<0.001

HMU*MSA	Pearson	0.51
interim	P value	0.002



What Did We Learn?

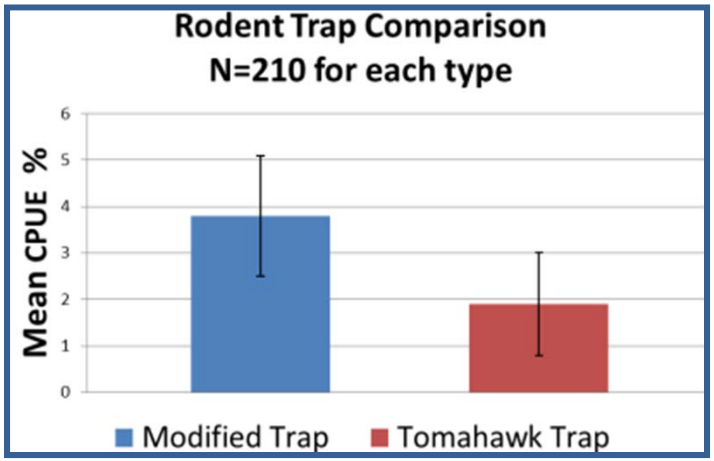
- Conclusions: Radio marked baits and bait station monitoring
  - Treated DNM aerially applied at 36/ha reduced BTS numbers
  - 4-5 applications provide extended suppression (5-6 months)
  - Effect on snake abundance on the HMU and MSA were similar
  - Non-target take < 1%

Results: Rodent Monitoring

- Seven sessions
- N = 2,772 trap nights total
  - HMU, N = 5 rats (*Rattus diardii*)
  - Zero on MSA and REF
- No increase in rodent numbers

Results: Offsite Trap Test

- N = 420 trap nights total (210 each)
  - Catch per unit effort (CPUE) modified traps 3.8/100 trap nights
  - CPUE tomahawk traps 1.9/100 trap nights
- Equivalent on test site CPUE = 105 rodents



What Did We Learn?

- Conclusions
  - No compensatory increase in rodent numbers over 22 months
  - Possible increase longer term?

Technology Implications

- Reduce BTS abundance at large scales
- Enhance DOD and WS interdiction efforts
- Conservation and mitigation on DOD lands
- Aid in species recovery efforts

Applications: Exit Port

Applications: Restoration, Mitigation

Technology Challenges

- Scaling up
- Regulatory considerations
  - National Environmental Policy Act (NEPA)
  - Environmental Protection Agency
- Toxicant and bait procurement issues
- Non-targets
- Cost of deployment and monitoring
  - $684/ha/application

Future Directions

- Automated bait production and delivery
  - 3,600 baits per load
  - 4 baits per second
  - 30 ha in 15 minutes (Dr. Shane Siers, NWRC Team Lead)
- Alternative baits
- Increased application rates
- YouTube https://www.youtube.com/watch?v=dU-8DRfHbSo

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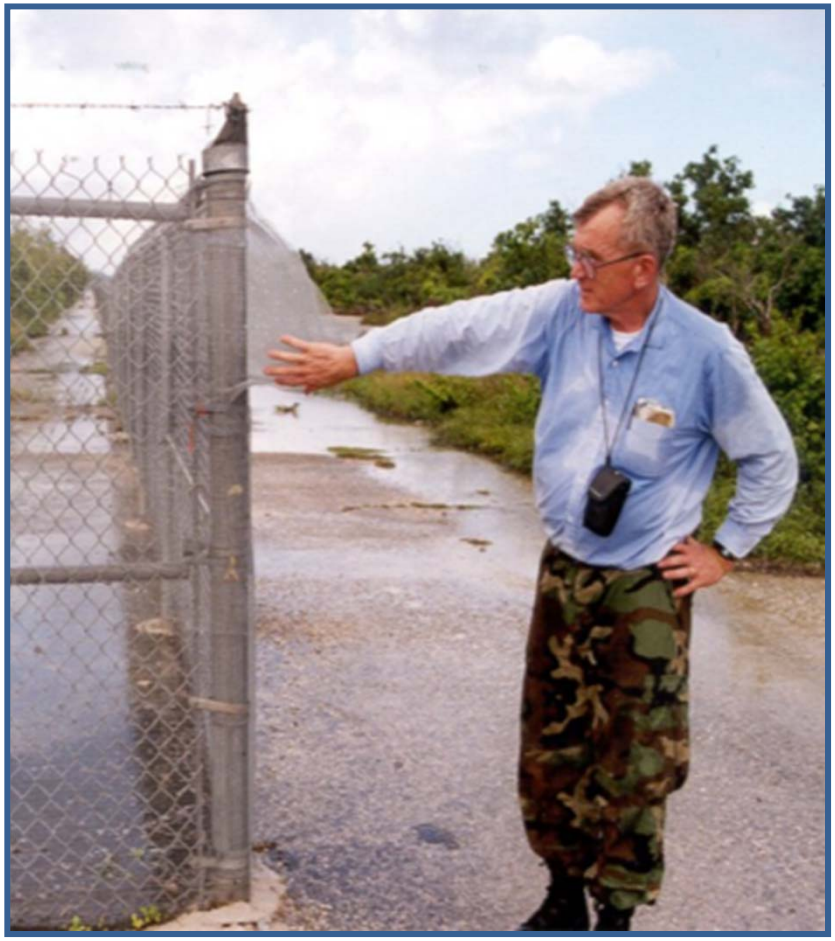
  - Andersen Air Force Base



For additional information, please visit

https://serdp-estcp.org/index.php/Program-Areas/Resource-Conservation-and-Climate-Change/Natural-Resources/Pacific-Island-Ecology-and-Management/RC-200925

Speaker Contact Information

brian.s.dorr@aphis.usda.gov; 662-325-8216

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