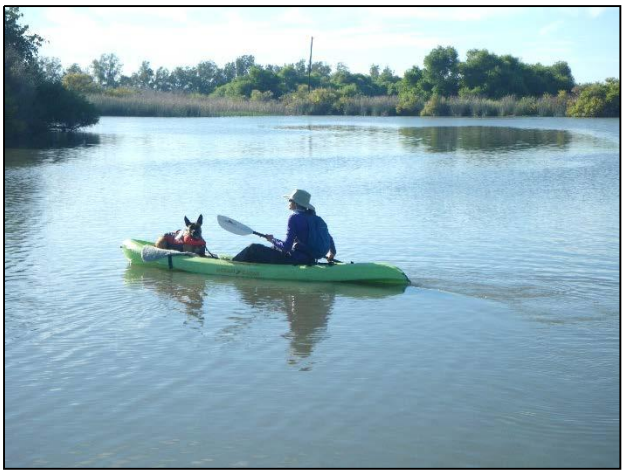

H.T. HARVEY & ASSOCIATES
Ecological Consultants

Giant Garter Snake Scent-Detection Dog Team Validation Guidelines

Prepared by:

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March 2018

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Section 1. Introduction and Purpose

Reptiles are suffering some of the most drastic declines of all terrestrial vertebrates (IUCN 2017). The International Union for Conservation of Nature currently reports that 13% of 5,847 assessed reptile species are endangered or critically endangered. Although reports of declines are numerous, reptiles remain a chronically understudied taxa. To successfully manage a wildlife population, gaining an understanding of the distribution and abundance of species affect important management decisions. Accurate detection and enumeration of individuals must be acquired to detect species declines or growth. Reliable survey data can be difficult to obtain for many reptiles that possess largely secretive habits, such as long periods of dormancy in underground refugia, and/or occur in ecosystems that can be difficult to survey, such as heavily vegetated stream banks or murky or deep water. Because detection techniques that limit false negative error rates are critical to the study of rare and cryptic reptiles, detection dogs have been applied to the detection of several species in recent years, such as pythons (Romagosa et al. 2011), indigo snakes (Stevenson et al. 2010), brown tree snakes (Engeman et al. 1998; Savidge et al. 2011), and desert tortoises (Cablk and Heaton 2006).

Dogs have the ability to distinguish a vast amount of olfactory information in their environment, and a large body of scientific literature suggests that properly trained scent dogs detect targets more efficiently and reliably than human surveyors, especially when the target is small or otherwise obscured from vision (Goodwin et al. 2010, Cablk and Heaton 2006, Cablk et al. 2008, and Reyes et al. 2016). As demonstrated by these and other studies, detection dogs can offer more efficient surveys and greater accuracy, largely because of their ability to detect smaller targets, including those obscured from view, at greater distances than human surveyors. Recent uses and studies to test the use of detection dogs to survey for the elusive giant garter snake (*Thamnophis gigas*) show promise for a reliable alternative or complimentary method to current protocols.

The current recommended adaptive survey protocol for giant garter snake (USGS 2009) calls for extensive live-trapping in the aquatic habitat during the active season when water temperatures are above 20 to 25°C. This entails setting at least 50 traps and checking them daily for a minimum of 30 days. This laborious method can be used only during a certain time of year and only in aquatic habitat, and thus can explore correlations between upland characteristics and occupancy, but cannot characterize physical use. Another method of detection, analysis of environmental DNA (eDNA), could potentially detect small amounts of giant garter snake DNA in bodies of water and outside mammal burrows; however, surveyors collecting eDNA samples would benefit from an efficient way to focus the sampling effort.

The abilities of scent-detection dogs offer an alternative or complimentary survey method to more efficiently characterize giant garter snake presence and absence. Detection dogs can be used for surveys in the upland habitat where snakes lie dormant in burrows for much of the year, along banksides where snakes temporarily seek refuge or bask, and even in the water. The capabilities of dogs broaden the survey window and can cover all three required habitats, as opposed to current methods that are restricted to the aquatic habitat during the

active period. This innovative approach could complement live trapping and eDNA studies or offer a viable alternative to these methods as a more efficient means of characterizing giant garter snake presence. H. T. Harvey & Associates conducted a pilot study (Ayres et al. 2016) to test the feasibility of using detection dogs for surveys of this species and followed it with a field survey (Powers et al. 2016) in areas with a low probability of occurrence. The training and trials of the detection dog teams demonstrated that the dogs could detect giant garter snake scent in a controlled field setting with low error rates. The training samples with residual scent were less than 10% of the size of a live, adult snake. It was suspected that the dogs would perform even better when charged with finding the actual snake.

Agencies have often developed standards, which are sometimes incorporated into protocols, upon which they base the approval of biologists to complete protocol-level surveys. In the past, agency personnel have expressed concern to us regarding their ability to review the qualifications of the training of ecological scent-detection dogs using various methods, and of the handlers that work them in the field. There are more than 50 publications in the peer reviewed literature that involve scent-detection dogs in ecological research. As the method has grown, so has the diversity of individuals and programs offering their detection dog services, including independent dog handlers, nonprofit organizations, universities, and for profit companies. In the United States, there currently are no accreditation programs that standardize quality control measures for detection dog and handler teams (dog-handler teams) to ensure that dog-handler teams deployed for ecological surveys are effective. Current ecological scent-detection dog programs vary in their business models, training philosophies, dog care guidelines, standards and level of education, and quality control criteria. Clients interested in employing detection dog services are limited in their ability to choose a quality program based on standardized quality control assurances, so instead may decide to choose a detection dog group based on reputation, availability, proximity, cost, and/or effective marketing.

To ensure efficient and rigorous data collection efforts, and the highest quality results, rigorous and science-based training is necessary for any detection dog and handler. The purpose of this document is to provide a giant garter snake scent-detection dog team validation guideline to establish standards and criteria that wildlife detection dogs and handlers must meet or exceed before being deployed on projects to survey for giant garter snakes. Standards, described more fully below, include guidelines for careful selection of dogs and handlers, implementation of reward-based training methods, and successful completion of a series of trials designed to test the accuracy and effectiveness of each dog-handler team.

Section 2. Detection Dogs and Handlers

2.1 Qualities of an Effective Giant Garter Snake Scent-Detection Dog

A dog must possess a unique set of innate qualities to be effectively trained in scent-detection work and to successfully navigate field surveys in many environmental conditions. Moreover, the qualities most favorable for the detection of specific species in a particular environment will vary. For instance, in some cases a methodical searcher is preferred and in other cases a faster, free-ranging searcher approach may be better suited. Detection dog breeds may vary greatly, but working breeds, such as Labrador retrievers, golden retrievers, German shepherds, Belgian malinois, spaniels, and border collies typically possess the qualities needed for ecological scent-detection work. Detection dogs may be acquired through any reputable outlet including animal shelters, private rescue organizations, and responsible breeding programs. Regardless of the specific breed or origin of the canine, an effective giant garter snake scent-detection dog must specifically possess the following qualities:

- Limitless motivation for a reward
    - Most detection dogs will work for a play reward and some may work for a food reward.
- Natural search ability
    - Effective detection dogs possess an innate desire to search for an object that is rewarding to them.
- Strong problem-solving skills
    - Successful detection dogs have a strong desire to think and act through training and environmental challenges to win a reward.
- A sociable demeanor
    - Detection dogs should not behave aggressively toward other animals or people. In addition, the dogs should desire interaction with their handlers.
- A stable temperament
    - Detection dogs should be able to work effectively when presented with typical challenges that may be encountered in the life of a working dog, such as extensive travel, variable environmental conditions, and wearing various protective equipment during surveys.
- Physical soundness
    - Detections dogs should be able to work efficiently in challenging habitats including upland refugia and on and around waterways. Giant garter snake scent-detection dogs may be required to traverse locations in a small vessel or kayak and should be capable of working in these situations.
- Ability to perform a *passive final response*

- Detection dogs working around giant garter snakes must be trained to offer a passive *final response*, such as sit, down or stare, upon locating a target. Aggressive *final responses* such as barking, scratching, or other high intensity behavior are not permitted for this type of work.

2.2 Education Requirements of an Effective Giant Garter Snake Scent-detection Dog Handler

Handling working dogs requires patience, persistence, problem-solving skills, and above average dog behavior knowledge and observation skills. Giant garter snake detection dog handlers shall receive an extensive education with experienced trainers and behavior experts, and must continuously hone their handling skills and stay up-to-date on the latest scientific research on canine behavior. Before handling detection dogs on giant garter snake projects, prospective handlers must understand and be able to effectively implement training and handling based on the following concepts:

- Animal Behavior and Learning Theory
  - Handlers must understand the fundamentals of canine behavior, cognition, learning, and communication.
- Reward-based Training Methodology
  - Handlers must understand and be able to implement a reward-based training method for all aspects of the dog's learning: scent training and basic foundation.
- Scent Theory
  - Handlers must understand how scent behaves in various terrain and weather conditions.
- Detection dog search methods
  - Handlers must know how to plan and implement an efficient and effective search pattern.
- Canine olfaction
  - Handlers must understand the physiological aspects of canine scenting.
- Canine search behavior
  - Handlers must be able to interpret each dog's unique search and alert behaviors.
- Detection dog-handler teamwork
  - Handlers must know when to direct the dog and when to let the dog take the lead.
- Proper use of Equipment
  - Handlers must know how to properly use training and survey gear such as, leashes (e.g. long-lines), clickers, rewards, and protective gear.
- Canine Health and Safety
  - Handlers must attend canine first aid and cardiopulmonary resuscitation training; know how to prevent illness and injury while working in the field; how to interpret the dog's behavior and physiological responses to recognize signs of illness, injury, or stress; and what to do in the event of a dog health emergency.

- Knowledge of giant garter snake morphology, behavior, and ecology
    - Handlers must understand the physical characteristics, behavior, and habitat of the giant garter snake in order to effectively and safely work a scent-detection dog in their environment.

Section 3. Preferred Giant Garter Snake Scent-Detection Dog Training Methodology

Training that principally motivates the dog using rewards (e.g., play or food) has been shown in the scientific literature to be the most effective and safe training process for both the dog and the handler. Reward-based training methods use the dog's innate desire for play, toys, food, or praise, for example, to teach the desired behaviors necessary for target scent detection. Classical conditioning is used to teach the dog that the presence of a specific target scent results in the delivery of a reward. This is referred to as *conditioning* or *imprinting* the target scent. Once the target scent has been strongly imprinted, the dogs are taught to search for and alert the handler to the presence of target scent to earn the reward. Training exercises are performed in an assortment of locations and in a variety of conditions to help the dog generalize the search behavior to many contexts. Each skill is built upon the last to build a strong, independent, and confident detection dog. Throughout the training process, both the learning style of the dog and the unique characteristics of the target scent should drive the specific training and reward style.

Section 4. Giant Garter Snake Scent-detection Dog Team Validation Trial

The following validation trial is designed to properly test the knowledge, accuracy, and efficiency of a giant garter snake dog-handler team. It also serves to determine the baseline detection and error rates for the giant garter snake detection dog teams. This validation process provides permitting and resource agencies, and potential clients, an understanding of the level of effort that will need to be expended in a particular environment to obtain a specific level of certainty regarding the presence of giant garter snakes. This validation process also creates a recognized and agreed upon standard for those organizations and individuals working in the field of giant garter snake ecology and conservation for quality control purposes.

The Giant Garter Snake Scent-Detection Dog Team Validation Trial consists of an assessment of the handler's qualifications and three practical tests: a Scent Recognition Test (SRT), a Field Search Test in a terrestrial environment (FST-T), and a Field Search Test in an aquatic environment (FST-A). These tests have been designed specifically to assess the knowledge and skills required to effectively and safely work with and around semi-aquatic reptiles. Each test must be completed and passed in the following sequence:

- Assessment of Handler Qualifications, meets qualifications or not
- Scent Recognition Test (SRT) with a pass rate of 100%
- Terrestrial Field Search Test (FST-T) with a pass rate of 80% or higher and an error rate of 10% or lower

And, if participation in aquatic surveys is anticipated:

- Aquatic Field Search Test (FST-A) with a pass rate of 80% or higher and an error rate of 10% or lower

A Giant Garter Snake Detection Dog Team will consist of one dog and one handler. If a handler has multiple trained dogs to choose from, he/she must pass the assessments with each dog. During testing, no overly harsh or inappropriate physical or verbal corrections by the handler to the dog will be permitted. Evaluators are to be selected and degreed or certified experts from the fields of ecology or biology, professional dog training, and/or professional scent dog training. Formal datasheets (Appendix B) shall be used for all SRT and FST tests and must be complete when submitted for review.

4.1 Assessment of Handler Qualifications

Goal: To confirm a handler's demonstrated understanding of dog behavior, dog training, detection dog handling, and giant garter snake ecology, morphology, and behavior; to verify evidence of thorough education and/ or experience in these areas.

Criteria:

- The application information needs to reflect direct education or experience with dog behavior, dog training, canine learning theory and training, scent theory and olfaction, and detection dog handling.
- At least 40 hours of demonstrable field experience conducting scent-detection dog surveys, including at least 10 hours of experience surveying for aquatic or semi-aquatic species.
- Familiarity with the biology and ecology of giant garter snakes, including demonstrated ability to identify individuals and likely habitat.
- Handler can correctly and reliably identify the *proximity alert* behaviors and *final response* offered by the scent dog when the dog is in the presence of giant garter snake scent, based upon trials described below.
- Handler is currently certified in pet CPR and first aid

Reporting: Provide a resume of education and experience, focusing on the minimum requirements listed in the qualifications above.

4.2 Scent Recognition Test (SRT)

Goal: To verify that the dog can correctly identify and perform a *passive final response* to giant garter snake scent during a container drill, to demonstrate that the dog exhibits a characteristic *change of behavior* in the presence of giant garter snake scent, and to demonstrate that the handler can identify the characteristic behavior change in the dog when it has detected the target scent.

Methods: This is a single-blind (handler does not have knowledge of the location of the scent) container drill repeated in five consecutive *runs* over two *sessions* for a total of ten *runs*. All *runs* shall be filmed to promote learning and to provide a record of the test. A person with knowledge of the location of the target scent will observe and verify correct or incorrect alerts in real time for the handler. Targets shall consist of *residual odor* from live giant garter snakes. For example, capture bags that have held only giant garter snakes can be cut into pieces and used for training, or the scent may be collected by rubbing the snake with a cotton swab. Samples must be free of human or conflicting odors and must be collected within one month of the test and stored in either a refrigerator or freezer until testing. Samples must be properly warmed/thawed for a minimum of one hour at ambient temperature before the test is conducted. One target shall be placed in one container per *run* and the other nine containers shall be empty. Containers may vary in type but must be identical to each other

during the trial. Examples of acceptable container types include: mailing boxes, clean paint cans, and PVC tubes. The container type may be adjusted to best suit the needs of the testing. Containers shall be placed in a single line. If the testing is conducted outside, the line of boxes should be set with a crosswind when possible and should be set as far downwind as possible in the allotted space. After each *run*, the line is to be moved in the upwind direction. If the dog is worked on the upwind side of the line, this will reduce the likelihood of the dog alerting to the lingering scent from a previous *run*. Containers should be spaced approximately 4 feet apart and the line of containers should be moved no less than 2 feet upwind between *runs*.

Passing Criteria: The dog must correctly perform a passive *final response* at the target and the handler must correctly identify the dog's final response to all ten available targets during the ten consecutive *runs*. A false positive or false negative response will result in test failure. The team must reach 100% accuracy to pass. Teams may re-test after 14 days from test failure.

Reporting: The results of the SRT, including photocopies of the data sheets (Appendix B), shall be included in the application for authorization to conduct giant garter snake surveys.

4.3 Terrestrial Field Search Test (FST-T)

Goal: To verify that, in a field setting, the dog can correctly identify and perform a passive *final response* to giant garter snake scent; the dog exhibits a characteristic *change of behavior* when it recognizes the scent of giant garter snake; the handler can recognize the characteristic behavior change the dog exhibits when it has detected the target scent and the *proximity alert behaviors* when it is following the scent to the source; and the dog can discriminate between nontargets and/or controls.

Methods: This is a double-blind test conducted in five search areas in an environment which closely resembles real survey conditions, but is out of the target species range to avoid any unknown target presence. Search areas are to be approximately 30 x 30 meters. Each of the five search areas may contain 0 to 5 target samples and 0 to 3 nontarget and/or control samples. Because "0" is included as a possibility, a search area may be clear of targets and/or nontargets. However, no more than one search area is to be clear of targets. The team will have a maximum of 15 minutes to search each area. Time will be paused after each positive alert to allow for the dog's reinforcement. Targets shall consist of residual odor from live giant garter snakes, as described in the SRT section. Samples must be free of human or conflicting odors and must be collected within one month of the test and stored in either a refrigerator or freezer until testing. Samples must be properly warmed/thawed at ambient temperature for a minimum of one hour before the test is conducted. Nontargets shall consist of residual odor samples from sympatric reptiles such as valley garter snakes (*Thamnophis sirtalis fitchi*) and California king snakes (*Lampropeltis californiae*) and burrowing mammals, such as California ground squirrels (*Otospermophilus beecheyi*). The nontarget samples must be collected, stored, and warmed/thawed in the same manner as the target samples. Control samples shall consist of materials that were used for target and nontarget collection, such as cotton swabs or capture bags, and may be clean or include human odor. All samples shall be placed and recorded by a "setter" who will not be present at the time of the testing. An "observer", who has no knowledge

of the location or number of targets and nontargets in the search area, will record all alerts and film the test. If a second observer is used to film the test, he/she shall not have knowledge of the number or location of the targets and nontargets.

Sample Placement: The number of target, nontarget, and control samples per search area will be randomly assigned using a random number generator or roll of a die. All samples should be placed in a manner that closely mimics how the target animal might be found in its natural environment. Required sample placements for this test include a minimum of 50% burrow and/or buried hides (i.e. in an existing mammal burrow or manually dug hole resembling a natural burrow), the remaining hides may be camouflaged above-ground hides (i.e. hidden in vegetation or tucked into detritus). Adjustments to the number of samples may be necessary in order to meet these minimum requirements and should be noted on the data sheet. The test setter must take careful notes regarding the details of each sample placement; such as, location characteristics, depth, and height.

Passing Criteria: The dog-handler team must achieve a searcher efficiency rate of 80% or higher with a maximum of one (1) false positive response. In other words, the team must correctly identify at least 80% of the total available targets placed in the five search areas. Teams must demonstrate the ability to recognize the presence of giant garter snake scent with a reliable *proximity alert* or trained *final response* recognized correctly by the handler. If the team does not meet these standards, the test must be repeated. Teams may re-test after 14 days from test failure.

Reporting: The results of the FST-T, including photocopies of the data sheets, shall be included in the application for authorization to conduct giant garter snake surveys.

4.4 Aquatic Field Search Test (FST-A)

Goal: To verify that, in an aquatic setting, the dog can correctly identify and perform a passive *final response* to giant garter snake scent; the dog exhibits a characteristic *change of behavior* in the presence of giant garter snake; and the handler can recognize the characteristic behavior change the dog exhibits when it has detected the target scent and the *proximity alert behaviors* when the handler is guiding the dog to the source in a small vessel or kayak; and the team can work safely and effectively in a small vessel or kayak (when/ if required).

Methods: A biologist holding a Recovery and Interstate Commerce Permit (Section 10(a)(1)(A) of the ESA) for giant garter snake will direct the team to search 6 ponds, sloughs, or canals, or any combination therein. At least two, and up to three, water bodies will be known to have no giant garter snake presence (unoccupied). It is of great importance that there is 100% confidence that the unoccupied water bodies are indeed unoccupied (e.g. out of range of the snake or positioned such that a snake is unable to enter the water body). Also, at least three, and up to four, of the water bodies shall have known presence of giant garter snake, as evidenced by recent successful, permitted capture. The handler shall have no knowledge of pond occupancy prior to or during the survey effort. The team can choose whether to survey in a vessel on the water or survey with the dog on-lead along the perimeter of the water body. If the handler wishes to be certified to survey from a vessel, then at least

three of the trial surveys should be conducted from a vessel. The handler will make a determination of occupied or unoccupied, based on observations of the dog's *changes of behavior*, *proximity alerts*, or *final responses*. A handler assistant, without knowledge of the status of giant garter snake occupancy in the water bodies, will accompany the detection dog-handler team and record required data and the handler determination of occupancy (Appendix B). The assistant will then submit the results to the permitted giant garter snake biologist, who will assess the determinations and sign the datasheet with the results.

Passing Criteria: The dog-handler team must achieve a searcher efficiency rate of 80% (5 out of 6) or higher with a maximum of one false positive response. In other words, the team must correctly identify at least five of the six water bodies as occupied or unoccupied. Handlers must demonstrate the ability to recognize the presence of giant garter snake scent based on the dog's reliable *proximity alert behaviors* or passive *final response*. The dog-handler team must demonstrate the ability to work safely on the water, if/ when required. If the team does not meet these standards, the test must be repeated. Teams may re-test after 14 days of achieving an efficiency rate less than 80%.

Reporting: The results of the FST-A, including photocopies of the data sheets, shall be included in the application for authorization to conduct aquatic giant garter snake surveys.

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Stevenson, D. J., K. R. Ravenscroft, R. T. Zappalorti, M. D. Ravenscroft, S. W. Weigley, C. L. Jenkins. 2010. Using a wildlife detector dog for locating Eastern indigo snakes (*Drymarchon couperi*). Herpetological Review 41(4):437–442

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5.1 Resources

Dog Training Organizations

Association of Professional Dog Trainers
www.apdt.com

Certification Council for Professional Dog Trainers
www.ccpdt.org

National Association of Canine Scent Work
www.nacsw.net

Scientific Working Group on Dog and Orthogonal Detector Guidelines
www.swgdog.fiu.edu

Reading List for Detection Dog Handlers (listed alphabetically)

Animal Training: Successful Animal Management Through Positive Reinforcement by Ken Ramirez

Bones Would Rain From the Sky: Deepening Our Relationships with Dogs by Suzanne Clothier

Canine Body Language: A Photographic Guide by Brenda Aloff

Canine Ergonomics: The Science of Working Dogs by William S. Helton

Click to Calm – Healing the Aggressive Dog by Emma Parsons

Control Unleashed: Creating a Focused and Confident Dog by Leslie McDevitt

Culture Clash by Jean Donaldson

Dogs a New Understanding of Canine Origin, Behavior and Evolution by Raymond and Lorna Coppinger

Don't Shoot the Dog by Karen Pryor

Evolution of Canine Social Behavior by Roger Abrantes

Excel-erated Learning: Explaining How Dogs Learn and How Best to Teach Them by Dr. Pamela Reid

For the Love of a Dog: Understanding Emotion in You and Your Best Friend by Patricia McConnell

How Dogs Learn by Mary Burch and Bob Bailey

How Dogs Work by Ray Coppinger

How to Teach an Old Dog New Tricks by Ian Dunbar

Inside of a Dog: What Dogs See, Smell and Know by Dr. Alexandra Horowitz

Oh Behave! – Dogs from Pavlov to Premack to Pinker by Jean Donaldson

Plenty in Life is Free: Reflections on Dogs, Training and Finding Grace by Kathy Sdao

Scent and the Scenting Dog by William G. Syrotuck

The Other End of the Leash: Why We Do What We Do Around Dogs by Dr. Patricia McConnell

What the Dog Knows: The Science and Wonder of Working Dogs by Cat Warren

Video List for Detection Dog Handlers (listed alphabetically)

Assessing Dog to Dog Interactions by Sue Sternberg

Do as I Do: A New Training Method Based on Social Learning by Claudia Fugazza

The Language of Dogs: Understanding Canine Body Language & Other Communication Signals by Sarah Kalnajs

The Parker Videos: How One Dog Got Started in K9 Nose Work by NACSW and Christy Waehner

Appendix A. Glossary

Conditioning

A general term that explains how animals learn the connection between stimuli, events, and actions. In other words, the reaction (response) to an object or event (stimulus) by a person or animal can be modified by learning.

Imprinting

A phenomenon by which an animal during a formative stage of life forms a lasting attachment to, and preference for, some object or activity through exposure to the same, independent of consequences. In scent work, it is the process by which the detection dog learns to associate a target scent with a desirable reward.

Proximity Alert Behaviors

A set of behaviors that occur after the initial change of behavior when the detection dog is pursuing the source of a conditioned scent. These behaviors are characteristic of the dog being in the presence of a conditioned target scent and, importantly, are not observable when the dog is not in presence of a conditioned target scent.

Final Response

A dog's trained behavioral response to the source of a conditioned target scent. When a passive final response is trained, this behavior is displayed in a manner that does not disturb the environment (e.g. detection dog sits, stands, stares at or lies quietly after locating a trained odor). A passive, final response is generally the preferred response for wildlife detection dogs.

Change of Behavior

A characteristic pattern of behaviors, as interpreted by the handler, that occur when the dog initially detects a conditioned odor while surveying. This behavior differs from other olfactory interest that otherwise is exhibited by the dog in response to other odors in the environment. Examples: a sudden change in the dog's speed and/or direction of travel; change in rate and/or type of breathing or sniffing; shift in tail, ear, head and/or body carriage. Importantly, this change of behavior is only expressed when the dog is in the presence of a conditioned target scent.

Run

The search for a target scent along one line of 10 containers, one of which contains the target scent.

Session

A series of 5 runs.

Appendix B. Formal Datasheets for SRT, FST-T, and FST-A

H. T. HARVEY & ASSOCIATES
Ecological Consultants

Giant Garter Snake Scent Recognition Test (SRT-1)						
Date:		**Location:**		**Weather:**		
Dog:		**Handler:**		**Observer:**		
Other Participants:						
Session 1						
Target Position	**Target ID**	**Container type:**		**Total # of containers: 10**		
		Postivie Alert	False Alert	False Alert: Fringe	Pass	Not Pass
	Results					

Notes/Comments

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Giant Garter Snake Scent Recognition Test (SRT-2)

Date:	Location:	Weather:
Dog:	Handler:	Observer:
Other Participants:		

Session 2

Target Position	Target ID	Container type:		Total # of containers: 10		
		Positive Alert	False Alert	False Alert: Fringe	Pass	Not Pass
	Results					

Final Result:

Notes/Comments

Category	Input	Notes
Date:	Date	SRT is completed in 2 *Sessions* of 5 *Runs.* There is a datasheet for Session 1 and Session 2, which will have different dates. Scientific date format: DD Mon YYYY (i.e. 01 Jan 2018)
Location:	Test location name and GIS coordinates	
Weather:	Record: Temperature (°C); % Relative Humidity; Wind Speed (km/h); % Cloud Cover; Precipitation	
Dog:	Dog's name	Must be the same dog each *session*
Handler:	Handler's name	Must be the same *handler* each *session* . Must be different from *Observer* and *Other Participants* . The Handler has **no** knowledge of the positions of target samples in each run.
Observer:	SRT container setter and data recorder's name	Must be different from *handler.* The o*bserver* sets the containers and randomly assigns the target locations. The *observer* records the data during the test and must have knowledge of the positions of target samples in each run in order to inform the *handler* whether to reward the dog **AFTER** the *handler* has called a target.
Other Participants:	Names of other participants	It is required to film the SRT test. If an additional person is used for filming, include the name here. Filming can also be accomplished by using a camera stand or Go Pro attached to the *observer* . A different person may be used to set the containers and, if so, should be named here. The observer should still have knowledge of the locations of the targets for recording data and informing the handler of true or false positives. Indicate the role of each additional person.
Target Position:	Number 1 through 10	Each of the 10 containers will be assigned a number. The *target position* is the number of the container that the target is in.
Target ID:	Unique target ID number used in each *run*	There should be samples from several target individuals and each sample should have an identifying number. It is informative if a dog, or several dogs, consistently miss a certain sample and experiments should be run to ensure the sample is 1) good (uncontaminated) or 2) identifiable to the dog (is it a certain sex or age that the dog can't identify?).
Container Type:	Describe	Examples: mailing box; PVC tubes; upside-down terracotta pot, etc. All containers in a *run* should be identical and all should visually mask the target.

Total # of Containers:	This is pre-filled as "10"	The requirement is to use 10 containers for each *run* , 1 of which will hold the target scent.
Positive Alert:	X	If the dog performs the *passive final response* at the container with the target and the handler correctly interprets the alert, that is a *positive alert* . The handler will "declare" an alert to the observer and the observer will give a "yes" or "no". If yes, the dog can be rewarded and the team passes the *run* . If no, the dog is not rewarded and the team has a *false alert* or *fringe alert* (see below) and does not pass that *run* .
False Alert:	X	If the dog performs the *passive final response* at a container with no target scent, that is a *false alert* . The handler will "declare" an alert to the observer and the observer will give a "no". The dog is not rewarded and the team has a *false alert* and does not pass that *run* . The test can be stopped after a *false alert* because only a 100% detection rate is a passing score. The *session* can be repeated 2 weeks after test failure.
False Alert: Fringe	X	If the dog performs the *passive final response* at a container with no target scent because it is smelling scent from a nearby container, that is a *false alert: fringe* . The handler will "declare" an alert to the observer and the observer will give a "no". The dog is not rewarded and the team has a false alert and does not pass that run. A *false alert: fringe* is still a false alert. The test can be stopped after a *false alert: fringe* because only a 100% detection rate is a passing score. The session can be repeated 2 weeks after test failure. It is useful for the trainer to be aware of fringe false alerts because it is not a scent recognition deficiency, but rather something else to do with the environment or training, like handler interference or error, search style, sourcing issues, etc.

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Giant Garter Snake Field Search Test - Terrestrial (FST-T): SETTER FORM

Search Area 1

Date:	Location:	Start time:	End time:

Weather:

Setter(s):

# of Targets:	# of Nontargets:	# of Controls:	Search Area Size/Description:

Target ID	Location	Notes	Placement	Time
			A / B / C	
			A / B / C	
			A / B / C	
			A / B / C	
			A / B / C	

Nontarget ID	Location	Notes	Placement	Time
			A / B / C	
			A / B / C	
			A / B / C	

Control ID	Location	Notes	Placement	Time
			A / B / C	
			A / B / C	
			A / B / C	

Notes/Comments

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Giant Garter Snake Field Search Test - Terrestrial (FST-T): SETTER FORM

Search Area 2

Date:	Location:	Start time:	End time:

Weather:

Setter(s):

# of Targets:	# of Nontargets:	# of Controls:	Search Area Size/Description:

Target ID	Location	Notes	Placement	Time
			A / B / C	
			A / B / C	
			A / B / C	
			A / B / C	
			A / B / C	

Nontarget ID	Location	Notes	Placement	Time
			A / B / C	
			A / B / C	
			A / B / C	

Control ID	Location	Notes	Placement	Time
			A / B / C	
			A / B / C	
			A / B / C	

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Giant Garter Snake Field Search Test - Terrestrial (FST-T): SETTER FORM

Search Area 3

Date:	Location:	Start time:	End time:

Weather:

Setter(s):

# of Targets:	# of Nontargets:	# of Controls:	Search Area Size/Description:

Target ID	Location	Notes	Placement	Time
			A / B / C	
			A / B / C	
			A / B / C	
			A / B / C	
			A / B / C	

Nontarget ID	Location	Notes	Placement	Time
			A / B / C	
			A / B / C	
			A / B / C	

Control ID	Location	Notes	Placement	Time
			A / B / C	
			A / B / C	
			A / B / C	

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Giant Garter Snake Field Search Test - Terrestrial (FST-T): SETTER FORM

Search Area 4

Date:	Location:	Start time:	End time:

Weather:

Setter(s):

# of Targets:	# of Nontargets:	# of Controls:	Search Area Size/Description:

Target ID	Location	Notes	Placement	Time
			A / B / C	
			A / B / C	
			A / B / C	
			A / B / C	
			A / B / C	

Nontarget ID	Location	Notes	Placement	Time
			A / B / C	
			A / B / C	
			A / B / C	

Control ID	Location	Notes	Placement	Time
			A / B / C	
			A / B / C	
			A / B / C	

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Giant Garter Snake Field Search Test - Terrestrial (FST-T): SETTER FORM

Search Area 5

Date:	Location:	Start time:	End time:

Weather:

Setter(s):

# of Targets:	# of Nontargets:	# of Controls:	Search Area Size/Description:

Target ID	Location	Notes	Placement	Time
			A / B / C	
			A / B / C	
			A / B / C	
			A / B / C	
			A / B / C	

Nontarget ID	Location	Notes	Placement	Time
			A / B / C	
			A / B / C	
			A / B / C	

Control ID	Location	Notes	Placement	Time
			A / B / C	
			A / B / C	
			A / B / C	

Notes/Comments

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Category	Input	Notes
Date:	Date	Scientific date format: DD Mon YYYY (i.e. 01 Jan 2018)
Location:	Test location name and GIS coordinates	
Start Time:	Time at start of FST-T set-up	24-hour clock (i.e. 13:00)
End Time:	Time at end of FST-T set-up	24-hour clock (i.e. 13:00)
Weather:	Record: Temperature (°C); % Relative Humidity; Wind Speed (km/h); % Cloud Cover; Precipitation	
Setter:	FST-T setter's name	Must not be present for actual test. The person that sets the test search areas is the *setter* . The *setter* randomly assigns the locations, positions, and number of target, nontarget, and control samples. The *setter* places the target, nontarget and control samples in each search area. The *setter* must not be present during the test.
# of Targets:	The number of targets that were randomly assigned for the session.	Number of target samples in the session (0 to 5) must be randomly assigned by random number generator or roll of the die for each search area.
# of Nontargets:	The number of nontargets that were randomly assigned for the session.	Number of nontarget samples (0 to 3) must be randomly assigned for each search area by random number generator or roll of the die. Nontarget scent samples will originate from species that co-occur with giant garter snake.
# of Controls:	The number of control samples that were randomly assigned for the particular search area.	Number of control samples (0 to 3) must be randomly assigned for each search area by random number generator or roll of the die. Control samples will consist of materials used during scent collection or training.
Search Area Size/Description	Size and Narrative description of trial plot	Search areas are to be approximately 30 x 30 meters. Briefly describe terrain, slope, vegetation, or surrounding influences like busy roadways.
Target ID:	Unique target ID number of scent sample	There should be samples from several target individuals and each sample should have an identifying number. It is informative if a dog, or several dogs, consistently miss a certain sample and experiments should be run to ensure the sample is 1) good (uncontaminated) or 2) identifiable to the dog (is it a certain sex or age that the dog can't identify?). The *setter* should place each target on top of an indicator that reveals it is a target, so the handler can confirm the final responses AFTER they are announced to the observer during the test to facilitate reward delivery. We recommend color-coded golf tees, but whatever is used shall be camouflaged. Note the code in the *notes* section of each target.
Nontarget ID:	Unique ID number of scent sample	There should be samples from several nontarget species and each sample should have an identifying number. It is informative if a dog, or several dogs, consistently false alert at a certain sample. The setter should place each nontarget on top of an indicator that reveals it is a nontarget, so the handler can confirm the final responses AFTER they are announced to the observer during the test to facilitate reward delivery or to prevent wrongly rewarding the dog. We recommend color-coded golf tees, but whatever is used shall be camouflaged. Note the code in the notes section of each nontarget.
Control ID:	Unique ID number of scent sample	There should be several controls and each control should have an identifying number. It is informative if a dog, or several dogs, consistently false alert at a certain control or control sample. The setter should place each control on top of an indicator that reveals it is a nontarget, so the handler can confirm the final responses AFTER they are announced to the observer during the test to facilitate reward delivery or to prevent wrongly rewarding the dog. We recommend color-coded golf tees, but whatever is used shall be camouflaged. Note the code in the notes section of each control.
Location:	GIS coordinates of all sample placements	
Notes:	Narrative	Notes about positioning or adjustments that needed to be made.

Category	Input	Notes
Placement:	Above ground (A) / Below ground or Buried (B) / Concealed (C)	Circle the best description of the sample placement: e.g. select option (A) for a sample placed out in the open ; select option (B) for a sample placed inside a burrow; select option (C) for a sample obscured by a shrub
Set Time:	Time when the sample is placed	24-hour clock (i.e. 13:00)

Sample Placement: The number of target, nontarget, and control samples per search area will be randomly assigned using a random number generator or roll of a die. All samples should be placed in a manner that closely mimics how the target animal might be found in its natural environment. Required sample placements for this test include a minimum of 50% burrow and/or buried hides (i.e. in an existing mammal burrow or manually dug hole resembling a natural burrow), the remaining hides may be camouflaged above-ground (i.e. i.e. hidden in vegetation or tucked into detritus). Adjustments to the number of samples may be necessary in order to meet these minimum requirements and should be noted on the data sheet. The test setter must take careful notes regarding the details of each sample placement; such as, location characteristics, depth, and height. The setter must indicate whether each sample placed is a target, nontarget, or control by placing the sample on top of a coded indicator, such as a color-coded golf tee. If the sample cannot be placed on top of it, such as samples in burrows, then a nearby rock should be placed on top of the indicator. The indicator shall be completely camouflaged. During the test, the handler must be able to identify if the final response is a true positive or a false positive in order to reward the dog or not. The handler shall announce the final response to the observer before investigating the result as a true positive or false positive.

Methods: This is a double-blind test conducted in five search areas in an environment which closely resembles real survey conditions, but is out of the target species range to avoid any unknown target presence. Search areas are to be approximately 30 x 30 meters. Each of the five search areas may contain 0 to 5 target samples and 0 to 3 nontarget and/or control samples. Because “0” is included as a possibility, a search area may be clear of targets and/or nontargets. However, no more than one search area is to be clear of targets. The team will have a maximum of 15 minutes to search each area. Time will be paused after each positive alert to allow for the dog's reinforcement. Targets shall consist of residual odor from live giant garter snakes, as described in the SRT section. Samples must be free of human or conflicting odors and must be collected within one month of the test and stored in either a refrigerator or freezer until testing. Samples must be properly warmed/thawed at ambient temperature for a minimum of one hour before the test is conducted. Nontargets shall consist of residual odor samples from sympatric reptiles such as valley garter snakes (Thamnophis sirtalis fitchi) and California king snakes (Lampropeltis californiae) and burrowing mammals, such as California ground squirrels (Otospermophilus beecheyi). The nontarget samples must be collected, stored, and warmed/thawed in the same manner as the target samples. Control samples shall consist of materials that were used for target and nontarget collection, such as cotton swabs or capture bags, and may be clean or include human odor. All samples shall be placed and recorded by a “setter” who will not be present at the time of the testing. An “observer”, who has no knowledge of the location or number of targets and nontargets in the search area, will record all alerts and film the test. If a second observer is used to film the test, he/she shall not have knowledge of the number or location of the targets and nontargets.

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Giant Garter Snake Field Search Test - Terrestrial (FST-T) : OBSERVER FORM

Search Area 1

Date:	Location:	Start time:	End time:

Weather:

Observer(s):	Videographer(s):

Dog:	Handler:

Final Response to Target Location (True Positives)	Placement	Dog Confidence	Handler Confidence	Time
	A / B / C	H / M / L	H / M / L	
	A / B / C	H / M / L	H / M / L	
	A / B / C	H / M / L	H / M / L	
	A / B / C	H / M / L	H / M / L	
	A / B / C	H / M / L	H / M / L	

Final Response to Nontarget Location (False Positives)	Placement	Dog Confidence	Handler Confidence	Time
	A / B / C	H / M / L	H / M / L	
	A / B / C	H / M / L	H / M / L	
	A / B / C	H / M / L	H / M / L	

Final Response to Control Location (False Positives)	Placement	Dog Confidence	Handler Confidence	Time
	A / B / C	H / M / L	H / M / L	
	A / B / C	H / M / L	H / M / L	
	A / B / C	H / M / L	H / M / L	

Other False Positives	Location:	Placement	Dog Confidence	Handler Confidence	Time
Describe:		A / B / C	H / M / L	H / M / L	
Describe:		A / B / C	H / M / L	H / M / L	

Total Detections for Search Area 1	Targets	Nontargets	Controls

Notes/Comments

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Giant Garter Snake Field Search Test - Terrestrial (FST-T) : OBSERVER FORM

Search Area 2

Date:	Location:	Start time:	End time:

Weather:

Observer(s):	Videographer(s):

Dog:	Handler:

Final Response to Target Location (True Positives)	Placement	Dog Confidence	Handler Confidence	Time
	A / B / C	H / M / L	H / M / L	
	A / B / C	H / M / L	H / M / L	
	A / B / C	H / M / L	H / M / L	
	A / B / C	H / M / L	H / M / L	
	A / B / C	H / M / L	H / M / L	

Final Response to Nontarget Location (False Positives)	Placement	Dog Confidence	Handler Confidence	Time
	A / B / C	H / M / L	H / M / L	
	A / B / C	H / M / L	H / M / L	
	A / B / C	H / M / L	H / M / L	

Final Response to Control Location (False Positives)	Placement	Dog Confidence	Handler Confidence	Time
	A / B / C	H / M / L	H / M / L	
	A / B / C	H / M / L	H / M / L	
	A / B / C	H / M / L	H / M / L	

Other False Positives	Location:	Placement	Dog Confidence	Handler Confidence	Time
Describe:		A / B / C	H / M / L	H / M / L	
Describe:		A / B / C	H / M / L	H / M / L	

Total Detections for Search Area 2	Targets	Nontargets	Controls

Notes/Comments

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Giant Garter Snake Field Search Test - Terrestrial (FST-T) : OBSERVER FORM

Search Area 3

Date:	Location:	Start time:	End time:

Weather:

Observer(s):	Videographer(s):

Dog:	Handler:

Final Response to Target Location (True Positives)	Placement	Dog Confidence	Handler Confidence	Time
	A / B / C	H / M / L	H / M / L	
	A / B / C	H / M / L	H / M / L	
	A / B / C	H / M / L	H / M / L	
	A / B / C	H / M / L	H / M / L	
	A / B / C	H / M / L	H / M / L	

Final Response to Nontarget Location (False Positives)	Placement	Dog Confidence	Handler Confidence	Time
	A / B / C	H / M / L	H / M / L	
	A / B / C	H / M / L	H / M / L	
	A / B / C	H / M / L	H / M / L	

Final Response to Control Location (False Positives)	Placement	Dog Confidence	Handler Confidence	Time
	A / B / C	H / M / L	H / M / L	
	A / B / C	H / M / L	H / M / L	
	A / B / C	H / M / L	H / M / L	

Other False Positives	Location:	Placement	Dog Confidence	Handler Confidence	Time
Describe:		A / B / C	H / M / L	H / M / L	
Describe:		A / B / C	H / M / L	H / M / L	

Total Detections for Search Area 3	Targets	Nontargets	Controls

Notes/Comments

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Giant Garter Snake Field Search Test - Terrestrial (FST-T) : OBSERVER FORM

Search Area 4

Date:	Location:	Start time:	End time:

Weather:

Observer(s):	Videographer(s):

Dog:	Handler:

Final Response to Target Location (True Positives)	Placement	Dog Confidence	Handler Confidence	Time
	A / B / C	H / M / L	H / M / L	
	A / B / C	H / M / L	H / M / L	
	A / B / C	H / M / L	H / M / L	
	A / B / C	H / M / L	H / M / L	
	A / B / C	H / M / L	H / M / L	

Final Response to Nontarget Location (False Positives)	Placement	Dog Confidence	Handler Confidence	Time
	A / B / C	H / M / L	H / M / L	
	A / B / C	H / M / L	H / M / L	
	A / B / C	H / M / L	H / M / L	

Final Response to Control Location (False Positives)	Placement	Dog Confidence	Handler Confidence	Time
	A / B / C	H / M / L	H / M / L	
	A / B / C	H / M / L	H / M / L	
	A / B / C	H / M / L	H / M / L	

Other False Positives	Location:	Placement	Dog Confidence	Handler Confidence	Time
Describe:		A / B / C	H / M / L	H / M / L	
Describe:		A / B / C	H / M / L	H / M / L	

Total Detections for Search Area 4	Targets	Nontargets	Controls

Notes/Comments

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Giant Garter Snake Field Search Test - Terrestrial (FST-T) : OBSERVER FORM

Search Area 5

Date:	Location:	Start time:	End time:

Weather:

Observer(s):	Videographer(s):

Dog:	Handler:

Final Response to Target Location (True Positives)	Placement	Dog Confidence	Handler Confidence	Time
	A / B / C	H / M / L	H / M / L	
	A / B / C	H / M / L	H / M / L	
	A / B / C	H / M / L	H / M / L	
	A / B / C	H / M / L	H / M / L	
	A / B / C	H / M / L	H / M / L	

Final Response to Nontarget Location (False Positives)	Placement	Dog Confidence	Handler Confidence	Time
	A / B / C	H / M / L	H / M / L	
	A / B / C	H / M / L	H / M / L	
	A / B / C	H / M / L	H / M / L	

Final Response to Control Location (False Positives)	Placement	Dog Confidence	Handler Confidence	Time
	A / B / C	H / M / L	H / M / L	
	A / B / C	H / M / L	H / M / L	
	A / B / C	H / M / L	H / M / L	

Other False Positives	Location:	Placement	Dog Confidence	Handler Confidence	Time
Describe:		A / B / C	H / M / L	H / M / L	
Describe:		A / B / C	H / M / L	H / M / L	

Total Detections for Search Area 5	Targets	Nontargets	Controls

Notes/Comments

Category	Input	Notes
Date:	Date	Scientific date format: DD Mon YYYY (i.e. 01 Jan 2018)
Location:	Test location name and GIS coordinates	
Start Time:	Time at start of each Search Area of FST-T	24-hour clock (i.e. 13:00)
End Time:	Time at start of each Search Area of FST-T	24-hour clock (i.e. 13:00); search of each area should be accomplished in 15 minutes.
Weather:	Record: Temperature (°C); % Relative Humidity; Wind Speed (km/h); % Cloud Cover; Precipitation	
Dog:	Dog's name	Dog must have passed the SRT test, with the same handler, to move on to FST-T
Handler:	Handler's name	Must be different from *Setter* . Handler must have passed the SRT test, with the same dog, to move on to FST-T. The *Handler* has no knowledge of the locations, positions, placements, or number of target, nontarget and/or control samples in each plot.
Observer:	Data recorder's name	Must be different from *Setter. Observer* may also serve as *Videographer* ,which is best accomplished using a body camera. The *Observer* records the data on this form during the test. The *Observer* has **no** knowledge of the locations, positions, placements, or number of target, nontarget and/or control samples in each plot.
Videographer:	Camera operator's name	Must be different from the *Setter* . *Videographer* may also serve as observer or handler if a body camera is worn by either. The v*ideographer* is the person who films the test. The v*ideographer* has **no** knowledge of the locations, positions, placements, or number of target, nontarget and/or control samples.
Final Response to Target Location	GIS coordinates of all target samples correctly identified by the dog-handler team	The handler will indicate to the observer when a putative target is found. The handler will then lift the sample, or nearby rock, to reveal an identifying marker to indicate if it is a nontarget, target, or control. The handler will then let the observer know so as to properly record it as a true positive .
Final Response to Nontarget Location	GIS coordinates of all false positive final responses by the dog-handler team.	The handler will indicate to the observer when a putative target is found. The handler will then lift the sample, or nearby rock, to reveal an identifying marker to indicate if it is a nontarget, target, or control. The handler will then let the observer know so as to properly record it as a false positive.
Final Response to Control Location:	GIS coordinates of all false positive final responses by the dog-handler team.	The handler will indicate to the observer when a putative target is found. The handler will then lift the sample, or nearby rock, to reveal an identifying marker to indicate if it is a nontarget, target, or control. The handler will then let the observer know so as to properly record it as a false positive.
Placement:	Above ground (A) / Below ground or Buried (B) / Concealed (C)	Circle the best descripton of the sample placement: e.g. select option (A) for a sample placed out in the open ; select option (B) for a sample placed inside a burrow; select option (C) for a sample obscured by a shrub
Dog Confidence:	High (H) / Moderate (M) / Low (L)	Circle the best descripton of the confidence level that the HANDLER states the dog displayed upon locating and giving a final response to a target sample.
Handler Confidence:	High (H) / Moderate (M) / Low (L)	Circle the best descripton of the confidence level that the HANDLER states they had in the dog's change in behavior and giving a final response to a target sample.
Time:	Time when each sample is found.	24-hour clock (i.e. 13:00)
Other False Positives:	Final responses to novel things not placed by the setter	Describe any species, human-made objects, or environmental objects the dog-handler team detected as a putative target.
Total Detections for Search Area		
Target	Total number of targets correctly identified by the team	
NonTarget	Total number of nontargets falsely identified by the team (fasle positives)	
Control	Total number of controls faslely identified by the team (false positives)	

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Giant Garter Snake Field Search Test - Terrestrial (FST-T): FINAL RESULTS FORM

Search Area 1

Date:	Location:	Start time:	End time:

Dog:	Handler:	Observer(s):

Setter(s):	Videographer(s):

# of Targets:	# of Nontargets:	# of Controls:	Search Area Size/Description:

Weather:		Placement	Final Response?	Time
Target ID:	Location:	A / B / C	Yes / No	
Target ID:	Location:	A / B / C	Yes / No	
Target ID:	Location:	A / B / C	Yes / No	
Target ID:	Location:	A / B / C	Yes / No	
Target ID:	Location:	A / B / C	Yes / No	
Nontarget ID:	Location:	A / B / C	Yes / No	
Nontarget ID:	Location:	A / B / C	Yes / No	
Nontarget ID:	Location:	A / B / C	Yes / No	
Control ID:	Location:	A / B / C	Yes / No	
Control ID:	Location:	A / B / C	Yes / No	
Control ID:	Location:	A / B / C	Yes / No	
Other Detection:	Location:	A / B / C		
Other Detection:	Location:	A / B / C		

	True Positive	True Negative: Nontarget	True Negative: Control	False Positive: Nontarget	False Positive: Control	False Negative	Detection Rate (%)	Error Rate (%)
Search Area 1 Results								

Notes/Comments

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Giant Garter Snake Field Search Test - Terrestrial (FST-T): FINAL RESULTS FORM

Search Area 2

Date:	Location:	Start time:	End time:

Dog:	Handler:	Observer(s):

Setter(s):	Videographer(s):

# of Targets:	# of Nontargets:	# of Controls:	Search Area Size/Description:

Weather:		Placement	Final Response?	Time
Target ID:	Location:	A / B / C	Yes / No	
Target ID:	Location:	A / B / C	Yes / No	
Target ID:	Location:	A / B / C	Yes / No	
Target ID:	Location:	A / B / C	Yes / No	
Target ID:	Location:	A / B / C	Yes / No	
Nontarget ID:	Location:	A / B / C	Yes / No	
Nontarget ID:	Location:	A / B / C	Yes / No	
Nontarget ID:	Location:	A / B / C	Yes / No	
Control ID:	Location:	A / B / C	Yes / No	
Control ID:	Location:	A / B / C	Yes / No	
Control ID:	Location:	A / B / C	Yes / No	
Other Detection:	Location:	A / B / C		
Other Detection:	Location:	A / B / C		

	True Positive	True Negative: Nontarget	True Negative: Control	False Positive: Nontarget	False Positive: Control	False Negative	Detection Rate (%)	Error Rate (%)
Search Area 2 Results								

Notes/Comments

H. T. HARVEY & ASSOCIATES
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Giant Garter Snake Field Search Test - Terrestrial (FST-T): FINAL RESULTS FORM

Search Area 3

Date:	Location:	Start time:	End time:

Dog:	Handler:	Observer(s):

Setter(s):	Videographer(s):

# of Targets:	# of Nontargets:	# of Controls:	Search Area Size/Description:

Weather:		Placement	Final Response?	Time
Target ID:	Location:	A / B / C	Yes / No	
Target ID:	Location:	A / B / C	Yes / No	
Target ID:	Location:	A / B / C	Yes / No	
Target ID:	Location:	A / B / C	Yes / No	
Target ID:	Location:	A / B / C	Yes / No	
Nontarget ID:	Location:	A / B / C	Yes / No	
Nontarget ID:	Location:	A / B / C	Yes / No	
Nontarget ID:	Location:	A / B / C	Yes / No	
Control ID:	Location:	A / B / C	Yes / No	
Control ID:	Location:	A / B / C	Yes / No	
Control ID:	Location:	A / B / C	Yes / No	
Other Detection:	Location:	A / B / C		
Other Detection:	Location:	A / B / C		

	True Positive	True Negative: Nontarget	True Negative: Control	False Positive: Nontarget	False Positive: Control	False Negative	Detection Rate (%)	Error Rate (%)
Search Area 3 Results								

Notes/Comments

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Giant Garter Snake Field Search Test - Terrestrial (FST-T): FINAL RESULTS FORM

Search Area 4

Date:	Location:	Start time:	End time:

Dog:	Handler:	Observer(s):

Setter(s):	Videographer(s):

# of Targets:	# of Nontargets:	# of Controls:	Search Area Size/Description:

Weather:		Placement	Final Response?	Time
Target ID:	Location:	A / B / C	Yes / No	
Target ID:	Location:	A / B / C	Yes / No	
Target ID:	Location:	A / B / C	Yes / No	
Target ID:	Location:	A / B / C	Yes / No	
Target ID:	Location:	A / B / C	Yes / No	
Nontarget ID:	Location:	A / B / C	Yes / No	
Nontarget ID:	Location:	A / B / C	Yes / No	
Nontarget ID:	Location:	A / B / C	Yes / No	
Control ID:	Location:	A / B / C	Yes / No	
Control ID:	Location:	A / B / C	Yes / No	
Control ID:	Location:	A / B / C	Yes / No	
Other Detection:	Location:	A / B / C		
Other Detection:	Location:	A / B / C		

	True Positive	True Negative: Nontarget	True Negative: Control	False Positive: Nontarget	False Positive: Control	False Negative	Detection Rate (%)	Error Rate (%)
Search Area 4 Results								

Notes/Comments

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Giant Garter Snake Field Search Test - Terrestrial (FST-T): FINAL RESULTS FORM

Search Area 5

Date:	Location:	Start time:	End time:

Dog:	Handler:	Observer(s):

Setter(s):	Videographer(s):

# of Targets:	# of Nontargets:	# of Controls:	Search Area Size/Description:

Weather:		Placement	Final Response?	Time
Target ID:	Location:	A / B / C	Yes / No	
Target ID:	Location:	A / B / C	Yes / No	
Target ID:	Location:	A / B / C	Yes / No	
Target ID:	Location:	A / B / C	Yes / No	
Target ID:	Location:	A / B / C	Yes / No	
Nontarget ID:	Location:	A / B / C	Yes / No	
Nontarget ID:	Location:	A / B / C	Yes / No	
Nontarget ID:	Location:	A / B / C	Yes / No	
Control ID:	Location:	A / B / C	Yes / No	
Control ID:	Location:	A / B / C	Yes / No	
Control ID:	Location:	A / B / C	Yes / No	
Other Detection:	Location:	A / B / C		
Other Detection:	Location:	A / B / C		

	True Positive	True Negative: Nontarget	True Negative: Control	False Positive: Nontarget	False Positive: Control	False Negative	Detection Rate (%)	Error Rate (%)
Search Area 5 Results								

FST-T Results

	True Positive	True Negative: Nontarget	True Negative: Control	False Positive: Nontarget	False Positive: Control	False Negative	Detection Rate (%)	Error Rate (%)
Overall Test Results								

Notes:

Final Results Form	Because the handler, the observer, and the videographer must all be "blind" for the FST-T, it is necessary to compare the "Setter Form" with the "Observer Form" to summarize the final results of the FST-T. The purpose of this form is to serve as a summary of results.	
Category	**Input**	**Notes**
Date:	Date	Scientific date format: DD Mon YYYY (i.e. 01 Jan 2018)
Location:	Test location name and GIS coordinates	
Start Time:	Time at start of each Search Area of FST-T	24-hour clock (i.e. 13:00)
End Time:	Time at start of each Search Area of FST-T	24-hour clock (i.e. 13:00); search of each area should be accomplished in 15 minutes.
Weather:	Record: Temperature (°C); % Relative Humidity; Wind Speed (km/h); % Cloud Cover; Precipitation	
Dog:	Dog's name	Dog must have passed the SRT test, with the same handler, to move on to FST-T
Handler:	Handler's name	Must be different from *Setter* . Handler must have passed the SRT test, with the same dog, to move on to FST-T. The *Handler* has no knowledge of the locations, positions, placements, or number of target, nontarget and/or control samples in each plot.
Setter:	Plot setter's name	Must not be present for actual test. The person that sets the test search areas is the *setter* . The *setter* randomly assigns the locations, positions, and number of target, nontarget, and control samples. The *setter* places the target, nontarget and control samples in each search area. The *setter* must not be present during the test.
Observer:	Data recorder's name	Must be different from *Setter. Observer* may also serve as *Videographer* , which is best accomplished using a body camera. The *Observer* records the data on this form during the test. The *Observer* has **no** knowledge of the locations, positions, placements, or number of target, nontarget and/or control samples in each plot.
Videographer:	Camera operator's name	Must be different from the *Setter* . *Videographer* may also serve as observer or handler if a body camera is worn by either. The *videographer* is the person who films the test. The *videographer* has **no** knowledge of the locations, positions, placements, or number of target, nontarget and/or control samples.
# of Targets:	The number of targets that were randomly assigned for the session.	Number of target samples in the session (0 to 5) must be randomly assigned by random number generator or roll of the die for each search area.
# of Nontargets:	The number of nontargets that were randomly assigned for the session.	Number of nontarget samples (0 to 3) must be randomly assigned for each search area by random number generator or roll of the die. Nontarget scent samples will originate from species that co-occur with giant garter snake.
# of Controls:	The number of control samples that were randomly assigned for the particular search area.	Number of control samples (0 to 3) must be randomly assigned for each search area by random number generator or roll of the die. Control samples will consist of materials used during scent collection or training.
Search Area Size/Description	Size and Narrative description of trial plot	Search areas are to be approximately 30 x 30 meters. Briefly describe terrain, slope, vegetation, or surrounding influences like busy roadways.
Target ID:	Unique target ID number of scent sample	There should be samples from several target individuals and each sample should have an identifying number. It is informative if a dog, or several dogs, consistently miss a certain sample and experiments should be run to ensure the sample is 1) good (uncontaminated) or 2) identifiable to the dog (is it a certain sex or age that the dog can't identify?). The *setter* should place each target on top of an indicator that reveals it is a target, so the handler can confirm the final responses AFTER they are announced to the observer during the test to facilitate reward delivery. We recommend color-coded golf tees, but whatever is used shall be camouflaged. Note the code in the *notes* section of each target.
Nontarget ID:	Unique ID number of scent sample	There should be samples from several nontarget species and each sample should have an identifying number. It is informative if a dog, or several dogs, consistently false alert at a certain sample. The setter should place each nontarget on top of an indicator that reveals it is a nontarget, so the handler can confirm the final responses AFTER they are announced to the observer during the test to facilitate reward delivery or to prevent wrongly rewarding the dog. We recommend color-coded golf tees, but whatever is used shall be camouflaged. Note the code in the notes section of each nontarget.

Category	Input	Notes
Control ID:	Unique ID number of scent sample	There should be several controls and each control should have an identifying number. It is informative if a dog, or several dogs, consistently false alert at a certain control or control sample. The setter should place each control on top of an indicator that reveals it is a nontarget, so the handler can confirm the final responses AFTER they are announced to the observer during the test to facilitate reward delivery or to prevent wrongly rewarding the dog. We recommend color-coded golf tees, but whatever is used shall be camouflaged. Note the code in the notes section of each control.
Location:	GIS coordinates of all sample placements	
Placement:	Above ground (A) / Below ground or Buried (B) / Concealed (C)	Circle the best description of the sample placement: e.g. select option (A) for a sample placed out in the open ; select option (B) for a sample placed inside a burrow; select option (C) for a sample obscured by a shrub
Final Response?:	Yes / No	Circle (Yes) if the dog performed a final response at the sample. Circle (No) if the dog performed a final response at the sample.
Time:	Time when each sample was found.	24-hour clock (i.e. 13:00)
Other False Positives:	Final responses to novel things not placed by the setter	Describe any species, human-made objects, or environmental objects the dog-handler team detected as a putative target.
Results by Search Area		
True Positive:	Number of final responses at a target sample for each search area.	
True Negative: Nontargets:	Number of nontarget samples for which the dog did not perform a final response.	
True Negative: Controls	Number of control samples for which the dog did not perform a final response.	
False Positive: Nontargets	Number of final responses at a nontarget sample.	
False Positive: Controls	Number of final responses at a control sample.	
False Negative:	Number of missed target samples for each search area.	
Detection %:	Number of True Positives divided by the number of targets available in each search area * 100.	
Error %:	Number of false positives divided by the number of true positives in each search area * 100.	
Overall Test Results		
True Positive:	Total number of final responses at a target sample.	
True Negative: Nontargets:	Total number of nontarget samples for which the dog did not perform a final response.	
True Negative: Controls	Total number of control samples for which the dog did not perform a final response.	
False Positive: Nontargets	Total number of final responses at a nontarget sample.	
False Positive: Controls	Total number of final responses at a control sample.	
False Negative:	Total number of missed target samples for each search area.	
Detection Rate (%)	Total number of true positives divided by the total number of targets available * 100.	
Error Rate (%):	Total number of false positives divided by the total number of true positives in each search area * 100.	

Passing Criteria: The dog-handler team must achieve a detection rate of 80% or higher with a maximum of one (1) false positive response. In other words, the team must correctly identify at least 80% of the total available targets placed in the five search areas. Teams must demonstrate the ability to recognize the presence of giant garter snake scent with a reliable proximity alert or trained final response recognized correctly by the handler. If the team does not meet these standards, the test must be repeated. Teams may re-test after 14 days from test failure.

H. T. HARVEY & ASSOCIATES
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Giant Garter Snake Field Search Test - Aquatic (FST-A) : RESULTS FORM

Water Body 1

Date:	Location:	Start time:	End time:

Observer(s):	Handler:

Dog:	Videographer(s):

Water Body Description:	Weather:

Survey Method		Determination of Giant Garter Snake Presence		Dog Confidence	Handler Confidence	Known Occupancy	
Vessel on Water	Perimeter Search On-leash	Present	Not Present	H / M / L	H / M / L	Present	Not Present

Describe the survey approach and how a determination was made by the handler:

This Section to be Completed by GGS Consultant

Name, Affiliation, and Recovery Permit Number:

How was the occupancy determination made for this water body?

Check each box that applies:		Sign and Date to Certify Statements
I did not inform the handler or the observer of the GGS occupancy status of the water body.		
I am highly confident in my occupancy determination.		
I completed the results section above, indicating "present" or "not present" after the handler made the determination.		

Dog-handler Team Made the Correct Determination of GGS Presence:		
YES		
NO		

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Giant Garter Snake Field Search Test - Aquatic (FST-A) : RESULTS FORM

Water Body 2

Date:	Location:	Start time:	End time:

Observer(s):	Videographer(s):

Dog:	Handler:

Water Body Description:	Weather:

Survey Method		Determination of Giant Garter Snake Presence		Dog Confidence	Handler Confidence	Known Occupancy	
Vessel on Water	Perimeter Search On-leash	Present	Not Present	H / M / L	H / M / L	Present	Not Present

Describe the survey approach and how a determination was made by the handler:

This Section to be Completed by GGS Consultant

Name, Affiliation, and Recovery Permit Number:

How was the occupancy determination made for this water body?

Check each box that applies:		Sign and Date to Certify Statements
I did not inform the handler or the observer of the GGS occupancy status of the water body.		
I am highly confident in my occupancy determination.		
I completed the results section above, indicating "present" or "not present" after the handler made the determination.		

Dog-handler Team Made the Correct Determination of GGS Presence:	
YES	
NO	

H. T. HARVEY & ASSOCIATES
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Giant Garter Snake Field Search Test - Aquatic (FST-A) : RESULTS FORM

Water Body 3

Date:	Location:	Start time:	End time:

Observer(s):	Videographer(s):

Dog:	Handler:

Water Body Description:	Weather:

Survey Method		Determination of Giant Garter Snake Presence		Dog Confidence	Handler Confidence	Known Occupancy	
Vessel on Water	Perimeter Search On-leash	Present	Not Present	H / M / L	H / M / L	Present	Not Present

Describe the survey approach and how a determination was made by the handler:

This Section to be Completed by GGS Consultant

Name, Affiliation, and Recovery Permit Number:

How was the occupancy determination made for this water body?

Check each box that applies:		Sign and Date to Certify Statements
I did not inform the handler or the observer of the GGS occupancy status of the water body.		
I am highly confident in my occupancy determination.		
I completed the results section above, indicating "present" or "not present" after the handler made the determination.		

Dog-handler Team Made the Correct Determination of GGS Presence:		
YES		
NO		

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Giant Garter Snake Field Search Test - Aquatic (FST-A) : RESULTS FORM

Water Body 4

Date:	Location:	Start time:	End time:

Observer(s):	Videographer(s):

Dog:	Handler:

Water Body Description:	Weather:

Survey Method		Determination of Giant Garter Snake Presence		Dog Confidence	Handler Confidence	Known Occupancy	
Vessel on Water	Perimeter Search On-leash	Present	Not Present	H / M / L	H / M / L	Present	Not Present

Describe the survey approach and how a determination was made by the handler:

This Section to be Completed by GGS Consultant

Name, Affiliation, and Recovery Permit Number:

How was the occupancy determination made for this water body?

Check each box that applies:		Sign and Date to Certify Statements
I did not inform the handler or the observer of the GGS occupancy status of the water body.		
I am highly confident in my occupancy determination.		
I completed the results section above, indicating "present" or "not present" after the handler made the determination.		

Dog-handler Team Made the Correct Determination of GGS Presence:	
YES	
NO	

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Giant Garter Snake Field Search Test - Aquatic (FST-A) : RESULTS FORM

Water Body 5

Date:	Location:	Start time:	End time:

Observer(s):	Videographer(s):

Dog:	Handler:

Water Body Description:	Weather:

Survey Method		Determination of Giant Garter Snake Presence		Dog Confidence	Handler Confidence	Known Occupancy	
Vessel on Water	Perimeter Search On-leash	Present	Not Present	H / M / L	H / M / L	Present	Not Present

Describe the survey approach and how a determination was made by the handler:

This Section to be Completed by GGS Consultant

Name, Affiliation, and Recovery Permit Number:

How was the occupancy determination made for this water body?

Check each box that applies:		Sign and Date to Certify Statements
I did not inform the handler or the observer of the GGS occupancy status of the water body.		
I am highly confident in my occupancy determination.		
I completed the results section above, indicating "present" or "not present" after the handler made the determination.		

Dog-handler Team Made the Correct Determination of GGS Presence:	
YES	
NO	

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Giant Garter Snake Field Search Test - Aquatic (FST-A) : RESULTS FORM

Water Body 6

Date:	Location:	Start time:	End time:

Observer(s):	Videographer(s):

Dog:	Handler:

Water Body Description:	Weather:

Survey Method		Determination of Giant Garter Snake Presence		Dog Confidence	Handler Confidence	Known Occupancy	
Vessel on Water	Perimeter Search On-leash	Present	Not Present	H / M / L	H / M / L	Present	Not Present

Describe the survey approach and how a determination was made by the handler:

This Section to be Completed by GGS Consultant

Name, Affiliation, and Recovery Permit Number:

How was the occupancy determination made for this water body?

Check each box that applies:		Sign and Date to Certify Statements
I did not inform the handler or the observer of the GGS occupancy status of the water body.		
I am highly confident in my occupancy determination.		
I completed the results section above, indicating "present" or "not present" after the handler made the determination.		

Dog-handler Team Made the Correct Determination of GGS Presence:	
YES	
NO	

Category	Input	Notes
Date:	Date	Scientific date format: DD Mon YYYY (i.e. 01 Jan 2018)
Location:	Test location name and GIS coordinates	
Start Time:	Time at start of each water body of FST-A	24-hour clock (i.e. 13:00)
End Time:	Time at start of each water body of FST-A	24-hour clock (i.e. 13:00).
Dog:	Dog's name	Dog must have passed the SRT test, with the same handler, to move on to FST-A
Handler:	Handler's name	Must be different from *Observer.* Handler must have passed the SRT test, with the same dog, to move on to FST-A. The *Handler* has no knowledge of the GGS occupancy status of the water body.
Observer:	Data recorder's name	Must be different from *handler. Observer* may also serve as *videographer* , which is best accomplished using a body camera. The *Observer* records the data on this form during the test. The *Observer* has **no** knowledge of the GGS occupancy status of the water body.
Videographer:	Camera operator's name	*Videographer* may also serve as *observer* or *handler* if a body camera is worn by either. The *videographer* is the person who films the test. The *videographer* has **no** knowledge of the GGS occupancy status of the water body.
Water Body Description	Narrative description of water body	Include things, such as type of water body (canal, pond, slough, etc.), size, and other relevant features.
Weather:	Record: Air Temperature (°C); Water Temperature (°C); % Relative Humidity; Wind Speed (km/h); % Cloud Cover; Precipitation	
Survey Method	Circle one	Did you complete the survey on a small vessel, such as a kayak, or survey along the perimeter of the water body with the dog on-leash?
Determination of Giant Garter Snake Presence	Circle one	The handler will make a determination of occupied or not occupied and communicate it to the observer to record here.
Dog Confidence:	High (H) / Moderate (M) / Low (L)	Circle the best descripton of the confidence level that the HANDLER states the dog displayed when offering a proximity alert or final response.
Handler Confidence:	High (H) / Moderate (M) / Low (L)	Circle the best descripton of the confidence level that the HANDLER states he/she had in the dog's change in behavior, proximity alert, or final response.
Known Occupancy:	Circle one	This is to be completed by the GGS expert consultant after the survey
Describe the survey approach and how a determination was made by the handler:	Narrative description	Because aquatic surveys are not likely to yield a confirmed target, the behaviors the dog displays are left to handler interpretation. The handler may make a presence/absence determination based on several behaviors the dog is exhibiting at several moments during the survey. Therefore, a description of how the determination was made is more appropriate for aquatic surveys than requiring locations of exact alerts, etc. This section can be used to note exact locations of interest, if needed, also.
Name, Affiliation, and Recovery Permit Number:	GGS expert consultant information	To be filled in by the GGS expert
How was the occupancy determination made for this water body?	Narrative description	How does the GGS consultant know the water body is occupied or not? The GGS consultant must be **certain** that GGS either occupy or do not occupy the test ponds. Detection dogs have detected snake presence where exhaustive trapping has not, so negative trapping results are not enough to make an absence determination for this test. If there is any uncertainty, then the water body should be eDNA tested for GGS.

Category	Input	Notes
I did not inform the handler or the observer of the GGS occupancy status of the water body.	Check box	It is important that neither the handler nor the observer knows the status of the water bodies before the test surveys.
I am highly confident in my occupancy determination.	Check box	It is important that the GGS consultant has the highest possible level of certainty of the occupancy status of the water bodies.
I completed the results section above, indicating "present" or "not present" after the handler made the determination.	Check box	It is important that the GGS consultant provides the results of the survey, after the handler has made a determination.
Dog-handler Team Made the Correct Determination of GGS Presence:	Check Yes or No	This is the final result of the FST-A