OSAC RESEARCH NEEDS ASSESSMENT FORM

Title of research need:	Develop and validate STR/SNP panels (including any necessary allelic ladders and databases) for current species of forensic interest.
Describe the need:	Commercially developed STR/SNP kits do not exist for wildlife species. Wildlife Forensic Laboratories, therefore, develop their own STR/SNP panels, either through original research or by adopting primers from the research literature. Laboratories then validate these panels in-house and construct associated databases for population frequencies. Because of this lack of centralized support, each laboratory completes the development of its own panel of STRs and constructs its own database. Since allelic ladders are not typically developed for these panels, data are not easily transferable between laboratories. This means that any databases that are developed also cannot be shared. While not all wildlife species need standardized STR/SNP panels, many laboratories would benefit from standardization of panels and development of associated allelic ladders for common game species (e.g. North American deer species, moose, and bear), species of high international trade value (e.g. tigers, sturgeon, elephants), and commonly encountered domestic and livestock species (e.g. dogs, cats, horses, cattle). Research and development in this application, initially would involve developing sample databases that would then be used to identify and characterize genetic markers following OSAC Standards. Both existing and novel markers are potentially useful. Once an optimal marker panel has been developed for STR applications, an allelic ladder must be developed and made available to the relevant communities. Development of reference materials for these species is then needed. Development of the associated profile databases, either global or regional, whichever is applicable to the species of interest, is also required. Once a standardized panel and database is developed for a species, a thorough developmental validation following OSAC Validation Standards is necessary. This will require coordination among laboratories, validated reference materials, allelic ladders, and database development. All information must be made publicly available for the relevant community. All panels must be developed with the intention of having a full validation completed that is compliant with OSAC Validation Standards.
Keyword(s):	STR panel, SNP panel, allelic ladder, standardization, validation, game species, domestic species, livestock, wildlife.

Submitting subcommittee(s):	Wildlife Forensics	**Date Approved:**	10/7/2022

Background Information:

1. Does this research need address a gap(s) in a current or planned standard? (ex.: Field identification system for on scene opioid detection and confirmation)

Many laboratories would benefit from validated and standardization of panels and development of associated allelic ladders for common game species (such as North American deer, moose, and bear), and for species of high international trade value (tigers, sturgeon, and elephants), as well as for commonly encountered domestic and livestock species (dogs, cats, horses, and cattle).

2. Are you aware of any ongoing research that may address this research need that has not yet been published (e.g., research presented in conference proceedings, studies that you or a colleague have participated in but have yet to be published)?

Validated panels for North American black bear, and deer have been published. However, standardization is needed for these to be widely shared among laboratories.

3. Key bibliographic references relating to this research need: (ex.: Toll, L., Standifer, K. M., Massotte, D., eds. (2019). Current Topics in Opioid Research. Lausanne: Frontiers Media SA. doi: 10.3389/978-2-88963-180-3)

OSAC DNA Validation Standards (in development but based on previously published validation standards):

Butler, J.M. (2010) Fundamentals of Forensic DNA Typing. Elsevier Academic Press, San Diego, 520 pages

DeYoung, R.W., Demarais, S., Honeycutt, R.L., Gonzales, R.A., Gee, K.L., and Anderson, J.D. (2003). Evaluation of a DNA Microsatellite Panel Useful for Genetic Exclusion Studies in White-Tailed Deer. Wildlife Society Bulletin. 31(1):220-232.

Harper Cindy K, Vermeulen GJ, Clarke AB, de Wet JI, Guthrie AJ. (2013). Extraction of nuclear DNA from rhinoceros horn and characterization of DNA profiling systems for white (*Ceratotherium simum*) and black (*Diceros bicornis*) rhinoceros. FSI Genetics 7(4):428-433.

Huffman JE and Wallace JR, editors. (2012). Wildlife Forensics: Methods and Applications. John Wiley & Sons, Ltd., Chichester, West Sussex, UK.

Jobin RM, Patterson D, Zhang Y. (2008). DNA typing in populations of mule deer for forensic use in the Province of Alberta. Forensic Sci Int Genet 2(3):190-7.

Linacre A, Gumao L, Hecht W, Hellmann AP, Mayr WR, Parson W, Prinz M, Schneider PM, Morling N. (2014). ISFG: Recommendations regarding the use of non-human (animal) DNA in forensic genetic investigations. Forensic Sci Int Genet. 8(1): 90-100.

Linacre A, Tobe S. (2013). Wildlife DNA Analysis: Applications in Forensic Science. John Wiley & Sons, Ltd., Chichester, West Sussex, UK.

Meredith, E.P., Adkins, J.K., Rodzen, J.A. (2020). UrsaPlex: An STR multiplex for forensic identification of North American black bear (*Ursus americanus*). Forensic Science International: Genetics, 44, 102161.

Ogden, R., Dawnay, N., McEwing, R. (2009). Wildlife DNA forensics—bridging the gap between conservation genetics and law enforcement. Endangered Species Research 9(3):179-195.

Wictum E, Kun T, Lindquist C, Malvick J, Vankan D, Sacks B. (2013). Developmental validation of DogFiler, a novel multiplex for canine DNA profiling in forensic casework. Forensic Sci Int Genet. 7(1):82-91.

Scientific Working Group for DNA Analysis Methods (SWGDAM) Revised Validation Guidelines. Forensic Science Communications. July 2004, 6(4).

4. Review the annual operational/research needs published by the National Institute of Justice (NIJ) at https://nij.ojp.gov/topics/articles/forensic-science-research-and-development-technology-working-group-operational#latest? Is your research need identified by NIJ?

Forensic Biology/DNA, Scientific Research, Increased information about the discriminatory power and sensitivity of alternate biological analyses (e.g., proteomics, microbiome, plants, animals) to associate individuals with crime scene evidence.

5. In what ways would the research results improve current laboratory capabilities?

Development and validation of standardized panels, ladders, and databases would greatly reduce duplication of effort among laboratories and ensure continuity. Frequently, once the effort has been made in a given laboratory, the databases may not easily be shared. Development and validation of standardized panels, ladders, and databases would also improve quality by ensuring that each laboratory characterizes a minimum number of informative loci and uses similar terminology. Additionally, it would reveal landscape-wide population genetic structure that may not be apparent within a single laboratory's regional-specific database. Validation also brings all work to a higher standard.

6. In what ways would the research results improve understanding of the scientific basis for the subcommittee(s)?

Database sharing will improve our understanding of population structure within target species across a larger geographic range. Standardization ensures that similar methods and terminology is used among laboratories. Having thorough validations completed increases standardization which ensures that similar methods and terminology are used among laboratories. (This document was created from a merger of two previous documents approved on 2/3/2016 entitled "Develop STR/SNP panels (including any necessary allelic ladder and databases) for current species of forensic interest", and "Validate STP/SNP panels for species of forensic interest using the OSAC DNA validation standards").

7. In what ways would the research results improve services to the criminal justice system?

Currently, most consumers must have testing done at whichever laboratory has the appropriate database for the needed species and population. If panels were standardized, databases could be built jointly and shared, and multiple laboratories would be able to provide services to consumers. The cost for development of panels and databases would be decreased. Additionally, standardized panels would ensure a minimum number of informative loci are used.

8. Status assessment (I, II, III, or IV): I

	Major gap in current knowledge	Minor gap in current knowledge
No or limited current research is being conducted	I	III
Existing current research is being conducted	II	IV

This research need has been identified by one or more subcommittees of OSAC and is being provided as an informational resource to the community.