

Qualified Endangered and Threatened Species Surveyor Requirements

Overview

The Pennsylvania Fish and Boat Commission (PFBC) reviews projects to be permitted in or near habitats that may be occupied by endangered or threatened species. Site-specific surveys are a component of the project review process when a project activity potentially conflicts with an endangered or threatened species and its habitat. The PFBC has assembled lists of biologists who have documented their expertise to conduct surveys for endangered or threatened species in connection with a proposed or planned development activity. These lists include the names of those individuals who have demonstrated to the PFBC that they meet the qualifications necessary to search for and successfully find and correctly identify listed species and their habitat. In order to conduct PFBC recognized surveys for endangered or threatened species or their habitat in connection with a proposed or planned development activity, a surveyor must first be deemed qualified by the PFBC and placed on its qualified surveyors list. In addition, individuals who conduct presence/absence surveys for endangered or threatened species are required to have a valid Pennsylvania fishing license, a scientific collector's permit and threatened and endangered species permit issued by the PFBC. Only individuals, not firms, organizations, or other entities, will be considered for inclusion on a qualified list because the necessary experience can only be individually developed.

Project reviews, species effects analyses, and regulatory/permitting requirements are often directly affected by the presence of state or federally listed endangered or threatened species. Therefore, it is imperative that surveyors have the skills and ability to personally find and identify these species in their natural habitat. The required level of field experience must be maintained at all times to ensure the surveyor is maintaining search skills. A qualified surveyor must have extensive knowledge of the following: taxonomy, life history and habitat requirements of the targeted species group (with particular expertise regarding the endangered or threatened species), and sampling techniques for that species group.

To become qualified and be placed on the PFBC's qualified surveyors list, one must:

1. Read and understand the overview and the species group and taxa specific requirements.
2. Submit an application using the form provided, demonstrating that the applicant satisfies all general and species group or taxa specific requirements. Surveyors on PFBC lists as of January 5, 2013 will be deemed qualified for purposes of the new regulation but will be required to submit an application using the form provided. PFBC staff will act on applications within approximately 30 days.
 - a. General requirements include:
 - i. Taxonomy and Natural History: Applicants must demonstrate their mastery of species and habitat identification and natural history. A college degree in the biological sciences is preferred. Applicants must describe taxonomic coursework, workshops attended on species identification or any individualized training. Written materials (e.g., publications, reports, etc.) can be provided to demonstrate taxonomic or life history proficiency.
 - ii. Sampling Techniques: Applicants must demonstrate knowledge of sampling techniques. A college degree in the biological sciences is preferred. Applicant must describe training received in order to successfully implement species or taxa sampling protocols. This description must refer to relevant coursework (e.g., fisheries techniques, population dynamics, etc.), workshops or other training.

iii. Field Experience: Applicants must demonstrate that they possess a minimum of 50 days of field experience working with the targeted taxa within the preceding 10 years. Applicants must be able to find and correctly identify live endangered and threatened target species in their natural habitat as provided in the species or taxa specific requirements.

iv. The PFBC reserves the right to interview, test, and/or accompany the applicant in the field to judge the accuracy of target species and habitat identification skills, familiarity with natural history, and/or field survey techniques by the applicant.

b. Species or taxa specific requirements are set forth below.

Threatened and Endangered Species Group or Taxa Specific Qualified Surveyor Requirements

The following are descriptions of the necessary qualifications specific to certain species or groups.

1. Fishes

2. Mussels, Interior Basin or Atlantic Slope

3. Reptiles

a. Bog Turtle

b. Eastern Massasauga

c. Rough Green Snake

d. Eastern Redbelly Turtle

4. Amphibians

a. New Jersey Chorus Frog, Southern Leopard Frog, and Northern Cricket Frog

b. Eastern Spadefoot

c. Blue-spotted Salamander

d. Green Salamander

Fishes Qualified Surveyor Requirements

Section 1. Experience Related to Finding and Identifying Endangered & Threatened Species.

A qualified surveyor must be proficient with fish identification techniques and maintain current knowledge of fish taxonomy and distributions. Training and experience as a research or production taxonomist (Stribling et al. 2003) should be evident in the materials submitted with the application. Access to appropriate literature, reference materials, and laboratory equipment is expected. Nomenclature must follow appropriate and current sources such as the Integrated Taxonomic Information System (ITIS; <http://www.itis.gov/>) and the American Fisheries Society (Nelson et al. 2004 and subsequent corrections).

Surveyors must demonstrate familiarity with the Guidelines for Quality Assurance and Quality Control of Fish Taxonomic Data Collected as Part of the National Water Quality Assessment Program (Walsh and Meador 1998). Experience with endangered and threatened fishes must be demonstrated in the submitted materials.

- Submit a list of scientific names of all fish species the applicant has experience collecting and identifying. Fish identification experience must be evident within the documentation submitted.

Protocol References:

Stribling, J.B., S.R. Moulton II, and G.T. Lester. 2003. Determining the quality of taxonomic data. *Journal of the North American Benthological Society*: December 2003, Vol. 22, No. 4, pp. 621—631.

Walsh S.J. and M.R. Meador. 1998. Guidelines for Quality Assurance and Quality Control of Fish Taxonomic Data Collected as Part of the National Water Quality Assessment Program. Water-Resources Investigations Report 98-4239. USGS, Raleigh, North Carolina.

Nelson, J.S., Crossman, E.J., Espinosa-Pérez, H., Findley, L. T., Gilbert, C. R., Lea, R. N. & Williams, J. D. 2004. Common and Scientific Names of Fishes from the United States, Canada, and Mexico. Committee on Names of Fishes, 6th edn. Bethesda, MD: American Fisheries Society.

Section 2. Additional Education and Training Related to Identification, Habitat, and Natural History

- Include relevant certifications and certificates (Certified or Associate Fisheries Professional, USFWS Principles and Techniques of Electrofishing Certificate, USFWS Fish Identification Course, continuing education credits/courses, etc.).

Section 3. Protocol Implementation.

A qualified surveyor must be proficient with the appropriate gear types, methodologies, and protocols used to competently sample fish assemblages and their habitats. These will include, but are not limited to, the following: various electrofishing gears (Reynolds 1996), passive capture techniques (Hubert 1996), active fish capture methods especially benthic trawls and variants (Hayes et al. 1996; Herzog et al. 2005; Freedman et al. 2009), and fish community sampling protocols and methodologies (Barbour et al. 1999; Emery et al. 2003; Emery et al. 2006; Bonar et al. 2009; Miko 2011). Surveyors must be familiar with the Guidelines for the Use of Fishes in Research, specifically the Field Activities with Wild Fishes section (UFR 2004). Sampling objectives, habitat types, seasonality, and safety considerations should dictate survey planning. To be deemed qualified by the PFBC, surveyors must demonstrate to the PFBC's satisfaction that they are familiar with accepted survey protocols.

- Applicants need to demonstrate that they have conducted surveys incorporating techniques included in the protocol references below at least five times in the last 10 years and provide documentation of their role and participation in each survey. This documentation must demonstrate the applicant's experience using relevant gear types, applying methodologies, and implementing protocols. Fish identification experience must be evident within the documentation submitted.

This documentation may include final grant reports, posters, agency reports, peer reviewed publications, book chapters, thesis, dissertation, or project descriptions prepared specifically for this application (e.g., position held, support role on a project, museum experience, etc.). Experience as a fish survey crew leader must be evident within the materials submitted.

Protocol References:

Barbour, M.T., J. Gerritsen, B.D. Snyder, and J.B. Stribling. 1999. Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates and Fish, Second Edition. EPA 841-B-99-002. U.S. Environmental Protection Agency; Office of Water; Washington, D.C.

Bonar, Scott A., Wayne A. Hubert, and David W. Willis, editors. 2006. Standard Methods for Sampling North American Freshwater Fishes. American Fisheries Society, Bethesda, Maryland.

Emery, E.B., Thomas P. Simon, Frank H. McCormick, Paul L. Angermeier, Jeffrey E. Deshon, Chris O. Yoder, Randall E. Sanders, Shalliam D. Pearson, Gary D. Hickman, Robin J. Reash and Jeffrey A. Thomas. 2003: Development of a Multimetric Index for Assessing the Biological Condition of the Ohio River. Transactions of the American Fisheries Society 132(4):791—808.

Emery, E.B., J.A Thomas M. Bagley, and T.R. Angradi. 2006. Fish. In Angradi, T.R. (editor) Environmental Monitoring and Assessment Program: Great River Ecosystems, Field Operations Manual. EPA/620/R-06/002. U.S. Environmental Protection Agency, Washington, DC.

Freedman J.A., Timothy D. Stecko, Benjamin D. Lorson, and Jay R. Stauffer Jr. 2009. Development and efficacy of an electrified benthic trawl for sampling large-river fish assemblages. North American Journal of Fisheries Management 29:1001—1005.

Hayes, Daniel B., C. Paola Ferreri, and William Taylor. 1996. Active Capture Methods. Pages 193—220 in B.R. Murphy and D.W. Willis, editors. Fisheries Techniques, 2nd edition. American Fisheries Society, Bethesda, Maryland.

Herzog, D.P., V.A., Barko, J. S., Scheibe, R.A. Hrabik, and D.E. Ostendorf. 2005. Efficacy of a benthic trawl for sampling small-bodied fishes in large river systems. North America Journal of Fisheries Management 25:594—603.

Hubert, W.A. 1996. Passive Capture Techniques. Pages 157—181 in B.R. Murphy and D.W. Willis, editors. Fisheries Techniques, 2nd edition. American Fisheries Society, Bethesda, Maryland.

Miko, D., editor. 2011. Sampling Protocols for Pennsylvania's Wadeable Streams. Pennsylvania Fish and Boat Commission. Harrisburg, PA.

Reynolds, J. B. 1996. Electrofishing. Pages 221—251 in B.R. Murphy and D.W. Willis, editors. Fisheries Techniques, 2nd edition. American Fisheries Society, Bethesda, Maryland.

UFR (Use of Fishes in Research) Committee. 2004. Guidelines for the Use of Fishes in Research. American Fisheries Society, Bethesda Maryland.

2. Freshwater Mussel Qualified Surveyor Requirements

Please Note: Separate lists of qualified surveyors for freshwater mussels are maintained for the two primary mussel faunal groups in Pennsylvania: the Interior Basin (Ohio, Erie, and Genesee Watersheds) and the Atlantic Slope (Delaware, Potomac, and Susquehanna Watersheds)

Section 1. Experience Related to Finding and Identifying Endangered & Threatened Species

- Within the mussel faunal group for which qualification is sought, the applicant must have personally found at least 20 live individual Pennsylvania or federally listed mussels from seven or more unique sites within the past five years using survey methods approved by PFBC (see Section 3 for list of protocols). For the purpose of these requirements, “site” is defined as a one-mile long waterway segment. Sites sampled more than once do not count towards the total. For those seeking qualification to survey in the Ohio Basin, at least three of these seven sites must be in Pennsylvania. For those seeking qualification to survey in the Delaware, Potomac, or Susquehanna Basin, sites may be outside of Pennsylvania. Freshly dead and relic mussels, or those found by others on a survey team, do not count toward the minimum of 20 live individual endangered or threatened mussels.

Section 2. Additional Education and Training Related to Identification, Habitat, and Natural History

- Include relevant certifications and certificates (Certified or Associate Fisheries Professional, SCUBA certification, continuing education credits/courses, etc.).

Section 3. Protocol Implementation.

To be deemed qualified by the PFBC, surveyors must demonstrate to the PFBC's satisfaction that they are familiar with accepted species survey protocols. Accepted mussel survey protocols are listed here. Variations of these protocols or other protocols must be reviewed and approved by the PFBC.

Protocol References:

Smith, D.R., Vilella, R.F., and D.P. Lemarie. 2001. Survey protocol for assessment of endangered freshwater mussels in the Allegheny River, Pennsylvania. *Journal of the North American Benthological Society* 20(1): 118—132

Smith, D.R. 2006. Survey design for detecting rare freshwater mussels. *Journal of the North American Benthological Society* 25(3): 701—711

Ohio River Valley Ecosystem Mollusk Subgroup. 2004. Draft protocol for mussel surveys in the Ohio River where dredging/disposal/development activity is proposed (clarified April 2004)

Adaptive Management Group. 2007. A mussel sampling protocol to assess potential commercial dredging sites in Pools 2,3,4,5,7,8, and 9 in the Allegheny River and the Dashields, Montgomery, and New Cumberland Pools in the Ohio River, Pennsylvania (7 May 2007)

3. Reptiles Qualified Surveyor Requirements

a. Bog Turtle

Section 1. Experience Related to Finding and Identifying Bog Turtle

Applicant must demonstrate the ability to find and identify adult and juvenile life stages of the Bog Turtle.

- The applicant must have independently found 20 Bog Turtles at a minimum of five sites within the past five years using presence/inferred-absence survey techniques. The term site refers to a discrete wetland occupied by the turtles. Sites sampled more than once do not count towards total sites. Bog Turtles found dead (e.g., dead-on-road), found in traps, or found using radio telemetry do not count toward this criterion. Voucher photographs, site aerial photographs, site topographic maps, and field notes for each site must be available for examination by PFBC.

Section 2. Additional Education and Training Related to Identification, Habitat, and Natural History

- Provide documentation that within the past five years, surveyor has independently conducted or been an assistant on at least 10 habitat assessment surveys, accurately determining whether or not potential Bog Turtle habitat was present. These assessments will have taken into consideration all aspects of the species' life history.

Section 3. Protocol Implementation.

To be deemed qualified by the PFBC, surveyors must demonstrate to the PFBC's satisfaction that they are familiar with accepted species survey protocols. Within the past five years, surveyors must have conducted at least five presence/inferred-absence surveys in the capacity of principal investigator or ten presence/inferred-absence surveys as an assistant. Survey techniques must follow PFBC-recommended sampling methods or standard sampling methods for sampling Bog Turtles. Recognized survey protocols include the USFWS "*Guidelines for Bog Turtle Surveys*" (Revised April 2006). Variations of these or other protocols must first be reviewed and approved by the PFBC.

b. Eastern Massasauga

Section 1. Experience Related to Finding and Identifying Eastern Massasauga

Applicant must demonstrate the ability to find and identify all life stages (adults, juveniles) of the Eastern Massasauga.

- The applicant must independently have found Eastern Massasauga at a minimum of three sites within the past 10 years using presence/inferred-absence survey techniques. The term site refers to a habitat complex, which includes all habitats (e.g., overwintering (wetlands, seeps, streams), gestating (upland areas)) utilized for all of the life history phases of the species. No more than one habitat complex may be counted per HUC 12 watershed basin occupied by the species. Sites sampled more than once do not count towards total sites. At least two of these sites must have been in Pennsylvania. Eastern Massasaugas found dead (e.g., dead-on-road), found live crossing roads, or found using radio telemetry do not count toward this criterion. Sites sampled more than once do not count towards total sites. Voucher photographs, site aerial photographs, site topographic maps, and field notes for each site must be available for examination by PFBC.

Section 2. Additional Education and Training Related to Identification, Habitat, and Natural History

- Provide documentation that within the past 10 years, surveyor has independently conducted or been an assistant on at least 10 habitat assessment surveys, accurately determining whether or not potential Eastern Massasauga habitat was present. These assessments will have taken into consideration all aspects of the species' life history.

Section 3. Protocol Implementation.

To be deemed qualified by the PFBC, surveyors must demonstrate to the PFBC's satisfaction that they are familiar with accepted species survey protocols. Survey techniques must follow PFBC-recommended sampling methods or standard sampling methods for sampling Massasauga rattlesnakes. Recognized survey protocols include the PFBC "Guidelines for Eastern Massasauga Rattlesnake Surveys" (Revised June 10, 2005). Variations of these or other protocols must first be reviewed and approved by the PFBC.

Protocol References:

Casper, G.S., T.G. Anton, R.W. Hay, A.T. Holycross, R.S. King, B.A. Kingsbury, D. Mauger, C. Parent, C.A. Phillips, A. Resetar, R.A. Seigel, and T.P. Wilson. 2001. Recommended Standard Survey Protocol for the Eastern Massasauga, *Sistrurus catenatus catenatus*. U.S. Fish and Wildlife Service, Endangered Species Division.

c. Rough Green Snake

Section 1. Experience Related to Finding and Identifying Rough Green Snake

Applicant must demonstrate the ability to find and identify adult and juvenile life stages of the Rough Green Snake

- The applicant must have independently found Rough Green Snakes at seven sites within the past 10 years using presence/inferred-absence survey techniques. The term site refers to a habitat complex, which includes all habitats utilized for all of the life history phases of the species. No more than one habitat complex may be counted per HUC 12 watershed basin occupied by the species. Sites sampled more than once do not count towards total sites. At least three sites must come from Piedmont (not Coastal Plain) sites in Pennsylvania or Maryland. Rough green snakes found dead (e.g., dead-on-road), found live crossing roads, or found using radio telemetry do not count toward this criterion. Sites sampled more than once do not count towards total sites. Voucher photographs, site aerial photographs, site topographic maps, and field notes must be available for each site.

Section 2. Additional Education and Training Related to Identification, Habitat, and Natural History

- Provide documentation that within the past 10 years, the applicant has independently conducted or been an assistant on at least 10 Phase 1 habitat surveys or their research equivalent, accurately determining whether or not potential Rough Green Snake habitat was present. These assessments will have taken into consideration all aspects of the species' life history.

Section 3. Protocol Implementation.

To be deemed qualified by the PFBC, surveyors must demonstrate to the PFBC's satisfaction that they are familiar with accepted species survey protocols. Survey techniques must follow PFBC recommended sampling methods or standard sampling methods for sampling Rough Green Snakes and include the following techniques: timed-constrained visual encounter surveys, opportunistic searches, and nighttime spotlight surveys. Variations of these protocols or other protocols must be reviewed and approved by the PFBC.

Protocol References:

Karns, D.R. 1986. Field Herpetology: Methods for the Study of Amphibians and Reptiles in Minnesota. James Ford Bell Museum of Natural History, Occasional Paper 18. Variations of these or other protocols must first be reviewed and approved by the PFBC.

d. Eastern Redbelly Turtle

Section 1. Experience Related to Finding and Identifying Eastern Redbelly Turtle

Surveyor must demonstrate the ability to find and identify adult and juvenile life stages of the Eastern Redbelly Turtle as well as nests or eggs that are potentially from Eastern Redbelly Turtles.

- The applicant must have independently found Redbelly Turtles at seven sites, by more than one survey method, within the past 10 years using presence-inferred absence survey techniques. Three of these sites must document in-hand captures (traps, dipnets, and hand collections). Redbelly Turtles found dead (*e.g.*, dead-on-road), found live crossing roads, or found using radio-telemetry equipment do not count toward this criterion. The term site refers to a discrete section of waterway (separated from other sites by a minimum of 0.5 miles) occupied by Redbelly Turtles. Sites sampled more than once do not count towards total sites. Voucher photographs, site aerial photographs, site topographic maps, and field notes for each site must be available for examination by the PFBC.

Section 2. Additional Education and Training Related to Identification, Habitat, and Natural History

Provide documentation that within the past 10 years, the applicant has independently conducted or been an assistant on at least 10 Redbelly Turtle habitat assessments or equivalent research studies, accurately determining whether or not potential Redbelly Turtle habitat was present. These assessments will have taken into consideration all aspects of Redbelly Turtle life history (nesting habitat versus aquatic habitat).

Section 3. Protocol Implementation.

To be deemed qualified by the PFBC, surveyors must demonstrate to the PFBC's satisfaction that they are familiar with accepted species survey protocols. Recommendations for survey techniques for Redbelly Turtles can be found in project review letters from the PFBC, which may be obtained by contacting the PFBC at (814) 359-5237. These surveys should include visual surveys, aquatic trapping, as well as nest searches. Variations of these protocols or other protocols must be reviewed and approved by the PFBC.

Protocol References:

Karns, D.R. 1986. Field Herpetology: Methods for the Study of Amphibians and Reptiles in Minnesota. James Ford Bell Museum of Natural History, Occasional Paper 18. Variations of these or other protocols must first be reviewed and approved by the PFBC.

4. Amphibians Qualified Surveyor Requirements

a. New Jersey Chorus Frog, Southern Leopard Frog, and Northern Cricket Frog

Section 1. Experience Related to Finding and Identifying New Jersey Chorus Frog, Southern Leopard Frog and Northern Cricket Frog

The applicant must demonstrate the ability to find and identify all life stages (adults, metamorphs, tadpoles, eggs) for each of the Northern Cricket Frog, Southern Leopard Frog, and New Jersey Chorus Frog.

- The applicant must have independently found animals of each species at seven or more sites, by more than one survey method, within the past 10 years using presence/inferred-absence survey techniques. The term site refers to a habitat complex, which includes all habitats utilized for all of the life history phases of the species. No more than one habitat complex may be counted per HUC 12 watershed occupied by the species. Sites sampled more than once do not count towards total sites. At least half of the animals located must have been in-hand captures (traps, dipnets, hand) documented with voucher specimens or photographs. At least three of the sites must be in Pennsylvania or surrounding states (DE, MD, NJ, NY). Animals found dead (e.g., dead-on-road), found live crossing roads, or found using radio telemetry do not count toward this criterion. Voucher photographs, call recordings, site aerial photographs, site topographic maps, and field notes for each site must be available for examination by PFBC .

Section 2. Additional Education and Training Related to Identification, Habitat, and Natural History

- Provide documentation that within the past 10 years, the applicant has independently conducted or been an assistant on at least 10 Phase 1 surveys or their research equivalent, accurately determining whether or not potential endangered frog habitat was present. These assessments will have taken into consideration all aspects of the species' life history.

Section 3. Protocol Implementation.

To be deemed qualified by the PFBC, surveyors must demonstrate to the PFBC's satisfaction that they are familiar with accepted species survey protocols. Survey techniques must follow PFBC recommended sampling methods or standard sampling methods for amphibians and must include the following techniques: aquatic trapping, timed-constrained visual encounter surveys, opportunistic searches, auditory surveys, drift fencing with pitfall traps, and road cruising. Variations of these protocols or other protocols must be reviewed and approved by the PFBC.

Protocol References:

Heyer, W. R., M. A. Donnelly, R. W. McDiarmid, L.C. Hayek, and M. S. Foster, eds. 1994. *Measuring and Monitoring Biological Diversity: Standard Methods for Amphibians*. Smithsonian Institution Press, Washington.

Karns, D.R. 1986. *Field Herpetology: Methods for the Study of Amphibians and Reptiles in Minnesota*. James Ford Bell Museum of Natural History, Occasional Paper 18.

b. Eastern Spadefoot

Section 1. Experience Related to Finding and Identifying Eastern Spadefoot

The applicant must demonstrate the ability to find and identify all life stages (adults, metamorphs, tadpoles, eggs) of the Eastern Spadefoot.

- The applicant must have independently found Eastern Spadefoot at a minimum of seven sites, by more than one survey method, within the past 10 years using presence/inferred-absence survey

techniques. The term site refers to a habitat complex, which includes all habitats utilized for all of the life history phases of the species. No more than one habitat complex may be counted per HUC 12 watershed basin occupied by the species. Sites sampled more than once do not count towards total sites. At least half of these animals must have been in-hand captures (traps, dipnets, hand) documented with voucher specimens or photographs. Because Non-Coastal Plain habitat is significantly different in Pennsylvania than in surrounding states (CT, DE, MD, NJ, NY), at least three of the capture sites must be in Pennsylvania. Sites sampled more than once do not count towards total sites. Animals found live crossing roads may only count towards two of the required sites. Animals found dead (e.g., dead-on-road) or found using radio telemetry do not count toward this criterion. Voucher photographs, call recordings, site aerial photographs, site topographic maps, and field notes for each site must be available for examination by PFBC.

Section 2. Additional Education and Training Related to Identification, Habitat, and Natural History

- Provide documentation that within the past 10 years, the applicant has independently conducted at or been an assistant on at least 10 Phase 1 surveys or their research equivalent, accurately determining whether or not potential Eastern Spadefoot habitat was present. These assessments will have taken into consideration all aspects of the species' life history.

Section 3. Protocol Implementation.

To be deemed qualified by the PFBC, surveyors must demonstrate to the PFBC's satisfaction that they are familiar with accepted species survey protocols. Survey techniques must follow PFBC recommended sampling methods or standard sampling methods for amphibians and must include the following techniques: aquatic trapping, timed-constrained visual encounter surveys, opportunistic searches, auditory surveys, drift fencing with pitfall traps, and road cruising. Variations of these protocols or other protocols must be reviewed and approved by the PFBC.

Protocol References:

Heyer, W.R., M.A. Donnelly, R.W. McDiarmid, L.C. Hayek, and M. S. Foster, eds. 1994. *Measuring and Monitoring Biological Diversity: Standard Methods for Amphibians*. Smithsonian Institution Press, Washington.

Karns, D.R. 1986. *Field Herpetology: Methods for the Study of Amphibians and Reptiles in Minnesota*. James Ford Bell Museum of Natural History, Occasional Paper 18.

c. Blue-Spotted Salamander

Section 1. Experience Related to Finding and Identifying Blue-Spotted Salamander

The applicant must demonstrate the ability to find and identify all life stages (adults, juveniles, eggs) of the Blue-spotted Salamander.

- The applicant must have independently found Blue-spotted Salamanders at a minimum of seven sites within the past 10 years using presence/inferred-absence survey techniques. The term site refers to a habitat complex, which includes all habitats utilized for all of the life history phases of the species. No more than one habitat complex may be counted per HUC 12 watershed basin occupied by the species. Sites sampled more than once do not count towards total sites. At least half of these animals must have been in-hand captures (traps, dipnets, hand collections) documented with voucher photographs. Animals

found dead (e.g., dead-on-road), found live crossing roads, or found using radio telemetry do not count toward this criterion. Voucher photographs, site aerial photographs, site topographic maps, and field notes for each site must be available for examination by PFBC.

Section 2. Additional Education and Training Related to Identification, Habitat, and Natural History

- Provide documentation that within the past 10 years, the applicant has independently conducted or been an assistant on at least 10 habitat assessments or their research equivalent, accurately determining whether or not potential Blue-spotted Salamander habitat was present. These assessments will have taken into consideration all aspects of the species' life history.

Section 3. Protocol Implementation.

To be deemed qualified by the PFBC, surveyors must demonstrate to the PFBC's satisfaction that they are familiar with accepted species survey protocols. Survey techniques must follow PFBC recommended sampling methods or standard sampling methods for amphibians and include the following techniques: aquatic trapping, timed-constrained visual encounter surveys, opportunistic searches, drift fencing with pitfall traps, and road cruising. Variations of these protocols or other protocols must be reviewed and approved by the PFBC.

Protocol References:

Heyer, W.R., M.A. Donnelly, R.W. McDiarmid, L.C. Hayek, and M.S. Foster, eds. 1994. *Measuring and Monitoring Biological Diversity: Standard Methods for Amphibians*. Smithsonian Institution Press, Washington.

Karns, D.R. 1986. *Field Herpetology: Methods for the Study of Amphibians and Reptiles in Minnesota*. James Ford Bell Museum of Natural History, Occasional Paper 18.

d. Green Salamander

Section 1. Experience Related to Finding and Identifying Green Salamander

The applicant must demonstrate the ability to find and identify all life stages (adults, juveniles, eggs) of the Green Salamander.

- The applicant must have independently found Green Salamanders at a minimum of seven sites within the past 10 years using presence-inferred absence survey techniques. The term site refers to a habitat complex, which includes all habitats utilized for all of the life history phases of the species. No more than one habitat complex may be counted per HUC 12 watershed basin occupied by the species. Voucher photographs must be available. Animals found dead (e.g., dead-on-road), found live crossing roads, or found using radio telemetry do not count toward this criterion. Sites sampled more than once do not count towards total sites. Voucher photographs, site aerial photographs, site topographic maps, and field notes for each site must be available for examination by PFBC.

Section 2. Additional Education and Training Related to Identification, Habitat, and Natural History

- Provide documentation that within the past 10 years, the applicant has independently conducted at least five or been an assistant on at least 10 habitat assessments or their research equivalent, that

accurately determined whether or not potential Green Salamander habitat was present. These assessments will have taken into consideration all aspects of the species' life history.

Section 3. Protocol Implementation.

To be deemed qualified by the PFBC, surveyors must demonstrate to the PFBC's satisfaction that they are familiar with accepted species survey protocols. Survey techniques must follow PFBC recommended sampling methods or standard sampling methods for amphibians and include the following techniques: Timed-constrained visual encounter surveys, opportunistic searches, and crevice sampling. Variations of these protocols or other protocols must be reviewed and approved by the PFBC.

Protocol References:

Heyer, W.R., M.A. Donnelly, R.W. McDiarmid, L.C. Hayek, and M.S. Foster, eds. 1994. *Measuring and Monitoring Biological Diversity: Standard Methods for Amphibians*. Smithsonian Institution Press, Washington.

Karns, D.R. 1986. *Field Herpetology: Methods for the Study of Amphibians and Reptiles in Minnesota*. James Ford Bell Museum of Natural History, Occasional Paper 18.