ANIMAL SAMPLING TECHNIQUES

Below are some animal sampling techniques for invertebrates, fish, and wildlife:

INVERTEBRATES

Invertebrate surveys are generally performed for threatened and endangered species (TES), species of special concern, or commercially important species (e.g., blue crab). Some species of butterflies, moths, mayflies, dragonflies, beetles, and mollusks are listed by NYSDEC as either threatened or endangered or as species of special concern. In addition, aquatic invertebrates, especially emergent aquatic insect larvae and crayfish, can serve as indicators of stream health.

A variety of techniques are used for sampling invertebrates. Some of the more common methods that may be applicable for CEQR studies are described here.

- *OBSERVATION.* This is often the easiest and least disruptive method to survey for invertebrates; however, an experienced invertebrate zoologist is required to identify specimens observed in the field. If specific TES and special concern species are targeted, experienced field biologists can review descriptions and life histories, examine known museum specimens including similar species that could also occur in the area, and other available information to make themselves capable of finding and identifying target species. The American Museum of Natural History and NYCDPR's Natural Resources Group are good sources for specimens. Observations can be categorized as direct or indirect, both of which are described below:
  - Direct observation. Direct observations may include observing invertebrates with the naked eye, hand magnifier or via another apparatus. It may be used for any type of invertebrate species. For aquatic organisms, a mask and snorkel may be appropriate. Direct observations may be made with or without collection of the organism in question.
  - Indirect observation. Indirect observations may include evidence of invertebrates, such as cast exoskeletons (exuviae), spent shells, or egg and larval stages. Spent shells can be found at muskrat middens and along watercourses and they serve as an especially good indicator for the presence of freshwater mussels.
- *INSECT NETTING.* Insect netting, or sweep netting, during appropriate season and time of day is a general method for collecting insects and consists of using a net specially tailored for capturing flying insects.
- *TRAPPING.* Two types of traps used to capture invertebrates are described below:
  - Light traps. Light traps use an ultraviolet or black light to attract insects, especially moths, where they are collected in a trap or attracted to a white sheet and selectively identified and removed. This is one of the better methods to survey moths.
  - Baited traps or stations. Invertebrates are attracted to bait (e.g., honey) and become trapped or feed at a station. Traps can be left over time but bait stations must be visited at regular intervals to increase the chance of encountering feeding individuals.
- *GRAB SAMPLE.* A grab sample is a single sediment sample taken from a particular location. Various types of equipment are available for collecting grab samples. Some of the more common sediment grab sampling devices include the Ponar sampler, the Ekman dredge, and the Smith-McIntyre substrate sampler. Each of these provides a quantitative sample. For a qualitative grab sample, a simple trowel or shovel can be used in shallow water.
- *SURBER SAMPLER.* A Surber sampler is used for quantitative sampling in shallow (30 cm or less), flowing water. It consists of a double-framed structure, hinged along one edge, with a

net attached to one of the frames. One of the frames is positioned securely on the stream bottom in riffle/run areas, and the other frame with the net is placed perpendicular to the bottom. The operator disturbs the area encompassed by the frame placed on the bottom and removes any attached organisms. Detached and disturbed benthic organisms then flow with the current into the net attached to the other frame.

- *DRIFT NET.* This sampling device consists of a net that is anchored in flowing water to catch macroinvertebrates that have migrated or become dislodged into the current. Sampling should be done for a predetermined amount of time, and nets should be checked frequently to prevent clogging. Sampling between dusk and 1:00 AM is optimal.
- *TOW NET.* Tow nets are used for qualitative sampling of benthic invertebrates, and they include devices ranging from simple sled-mounted nets to complex devices. These nets are towed behind boats and can yield quantitative results when towed for a standardized unit of time.
- *KICK OR DIP NET.* These types of nets are very versatile for collecting in shallow, flowing water. Generally, these devices are used for qualitative sampling, although when used with a standardized kicking technique, they can also be used for semi-quantitative sampling.
- *CLAM RAKE.* This device selectively retains larger items and organisms and is appropriate for use when performing qualitative sampling for mollusks. Generally, it is used along shorelines of creeks and rivers to supplement information obtained from other sampling techniques.
- *TRAWL.* A trawl is a funnel type net towed behind a boat. Generally, the only invertebrate targeted using this method is the blue crab, in which case the net would be set along the bottom of the water body.
- *ARTIFICIAL SUBSTRATE SAMPLER.* These types of samplers are of a standard composition and configuration and are placed in the water for a predetermined period of time, after which the degree of colonization by macroinvertebrates is determined. A variety of artificial substrate samplers are available, including the Hester-Dendy sampler and the basket sampler.

FISH

Fish survey techniques are specific to species and habitat types. Generally, more than one technique should be used, since most methods target only certain populations.

- *OBSERVATION.* Direct observations of fish species can be made from shore or from a boat. Sunglasses with polarizing lenses or binoculars are often useful tools when using this technique. Although observations are useful, they seldom account for all species present. Thus, if used, they should be combined with some of the additional techniques described below.
- ***ELECTROSHOCKING.*** Electroshocking is probably the best method to use for general fish surveys when there is no specific target species. Nevertheless, its effectiveness varies according to the species, habitat, and the size of the fish. Although the operative salinity range of the shocking units varies, electroshocking is not effective in moderate to high conductivity water bodies. Three types of electroshocking units are available.
    - Backpack Electroshocker. For a backpack electroshocker, the power unit is strapped backpack-style to the operator's back, and the anode and cathode probes are held by hand usually in front of the operator, although the cathode probe may trail behind. Since this type of electroshocker is operated while wading in the waterbody, it can only be used in smaller streams, creeks, and brooks.

- Stream Electroshocker. A stream electroshocker consists of a power unit, usually powered by a generator that is generally rested on the stream bank or floated in the water on a small boat. The operator operates the probes while wading in the waterbody, and usually two additional people are required to net the fish. This type of electroshocker is generally reserved for creeks, brooks, and small rivers.
- Boat Electroshocker. A boat electroshocker is generally used in deeper water (rivers, large ponds, and lakes). For this type of electroshocker, the entire unit, including the power source, generator and probes, is housed on a boat. Generally, one person guides the boat while two people net the fish and operate the probes. The probes are usually operated by pressing a pedal.

- *TRAWLS.* A trawl is a funnel-type net towed behind a boat. It can be set at different depths in the water column and is generally used for juvenile and adult fish.
- *SEINES.* A seine is a type of net that is used along the shoreline to encircle fish and pull them to shore. Seines work well in little to moderate current where there are few underwater obstructions and the shoreline is generally sloping. This method is used to collect fish that utilize nearshore habitat.
- *TRAP NETS.* Trap nets are designed to lead migrating fish into the trap of a net. Various designs of trap nets exist, but they typically have one to three leads or wings of webbing that are designed to intercept migrating fish. The leads and wings extend from the mouth of the net to an anchor. When fish encounter these obstacles, they swim around them and into the mouth of the net. Use of trap nets is a passive method that works well in waters with little current. This method causes little damage to the fish, except that predation can occur in the trap. It is also selective for migratory fish species that swim parallel to shorelines or structures. Trap nets are most commonly used in nearshore or shallow water.
- *GILL NETS.* Although the use of this method is strongly discouraged within the City, gill nets are nets with a specially designed mesh size that cause fish to become entangled in the net by their gills. The target fish are too large to move through the net, and attempt to escape by swimming backwards causes the gills to catch in the net. Gill nets are generally used in non-flowing waters, but they are sometimes also used in larger rivers. Since gill nets may cause severe damage to fish (loss of slime coat, loss of scales, stress, and possible suffocation), they are not commonly used.
- *LARVAL/ICHTHYOPLANKTON NETS.* Larval or ichthyoplankton nets are fine mesh nets that capture early life stages of fish. They can be towed behind boats along the bottom or in the water column. Some are attached to benthic sleds. Their placement depends on the type of eggs (demersal, adhesive, and pelagic) and the behavior of larvae (pelagic, demersal, etc.). Use of these nets should be timed according to the occurrence period of the species and life stage(s) targeted.
- *BENTHIC SLED.* A benthic sled is a sled-like structure that is towed behind a boat and has a net attached to it. Most often, this sampling device is used in conjunction with a larval net to collect early life stages of fish that occur along the bottom.
- *CREEL SURVEY.* A creel survey is selective for game species and consists of surveying anglers about their catch. In some cases, the captured fish can be weighed and identified. In other cases, information is obtained verbally from the angler.
- *HOOK & LINE.* This method employs the use of a rod and reels and can be employed from a boat, shoreline, pier, or dock. Since this is a selective, often time-consuming method, it

should generally only be used for qualitative studies of species presence/absence and to supplement other techniques.

- *DIPNET.* A dipnet is a small hand-held net that can be used to collect small fish along shorelines, banks, etc. Like the hook & line method, it is selective for certain species and is often time-consuming. It should therefore only be used in conjunction with other techniques.

WILDLIFE

The design of wildlife studies requires knowledge of the species expected to be present, especially when threatened and endangered species or species of special concern are likely to occur. Thus, information on habitat types, as well as general information on the seasonal occurrence, activity patterns, and behavior of the wildlife expected in the area, is essential in order to select stations and to time the surveys to maximize the chances of encountering various species. In addition, reconnaissance surveys help to identify what species may be present in the area and to select sampling locations. Areas of potentially suitable habitat for Threatened or Endangered Species (TES) or species of special concern should be searched at times when such species are most likely to be found. Other special habitats should also be selected and searched. These might include vernal pools, seeps, streams, rock outcrops, snags, etc. For species-specific TES surveys, a trained wildlife biologist with extensive experience finding the target TES should be used. Performing wildlife observations requires trained personnel with the ability to identify rapidly wildlife species by sight, sound, and sign. Figures, photos, or even video may aid in illustrating the location and distribution of sampling stations for the various types of surveys used.

- *OBSERVATION.* Observations of wildlife can either result from targeting certain species at certain times of day or night and during certain seasons, or they can be incidental while conducting other surveys. For example, incidental observations of wildlife can be recorded while performing wetlands delineation. Incidental observations are not adequate for analysis of potential impacts to wildlife and should only be used when only a general idea of the types of wildlife utilizing a site is necessary or to focus additional wildlife surveys. Both focused and incidental observations can be direct or indirect, as follows:
  - Direct observation. Direct observations may include observing wildlife with the naked eye, through binoculars, spotting scopes, or via another apparatus. This technique can be used for any type of wildlife species. Direct observations can be made with or without collection of the organism. The probability of direct observation of small mammals, reptiles, and amphibians is increased by searching under debris, logs, and rocks.
  - Indirect observation. Indirect observations include evidence of wildlife, such as amphibian and bird calls, bird songs, tracks, droppings, burrows, runs, caches, and remains, such as feathers, bones, skeletons, and roadkill.

  Field surveys should be designed to follow standardized methods, such as those described in technical publications and in the current scientific literature.
- *LIVE & SNAP TRAPS*. Because small mammals are secretive and nocturnal, trapping may be the best way to determine if they are present. Small mammals may be captured using live traps (traps designed not to kill the animal) and snap traps (traps designed to kill the animal instantaneously). Live traps work well for a variety of small mammals, and if needed, various baits can be used to target certain species. Snap traps should be avoided unless required by a natural resource agency. If used, specimens killed should be salvaged and provided to museums with information on where and when they were collected. Trapping results can provide information on both absolute (if live traps are combined with marking) and relative abundance. Care should be taken to make any traps set out as inconspicuous as possible

due to the sometimes-heavy traffic that can occur in some natural areas. Traps may need to be checked more often due to possible human interference. City, state and possibly federal scientific collection permits would be required to use this sampling method depending on the property where the research is conducted, and a NYSDEC License to Collect or Possess would likely be required for trapping activity. Consultation with relevant agencies is necessary to determine any permitting requirements.

- *PITFALL TRAPS*. Pitfall traps are depressions in the ground that animals fall into and from which they cannot escape. They work best when used together with drift fences, which are short vertical fences radiating out from the trap that act as runways that draw the animal(s) into the trap. These types of traps work well for shrews, other small mammals, and salamanders. The trap should be deep enough to prevent escape, but not so deep that it causes injury to the animal. If salamanders are targeted or are likely to be captured, enough water should be placed in the trap to prevent desiccation, but not too much to cause drowning of the animal(s). Pitfall traps should be designed with raised covers to prevent drowning due to excessive water accumulation in the trap and to prevent excessive sun exposure. The use of pitfall traps should be carefully considered prior to use, as they must be checked at frequent intervals to prevent undue heat or cold exposure, stress, or starvation of the trapped animal(s). This is a time-intensive method. City, state and possibly federal scientific collection permits would be required to use this sampling method depending on the property where the research is conducted, and a NYSDEC License to Collect or Possess would likely be required for trapping activity. Consultation with relevant agencies is necessary to determine any permitting requirements.
- *COVER BOARDS*. Cover boards are placed on the ground to attract small mammals, snakes, and salamanders for long term studies. They are left out for extended periods of time and are checked occasionally. The species found under the boards are identified and recorded. Cover boards can be made of a variety of materials, such as exterior plywood or corrugated roofing. City, state and possibly federal scientific collection permits would be required to use this sampling method depending on the property where the research is conducted, and a NYSDEC License to Collect or Possess would likely be required for trapping activity. Consultation with relevant agencies is necessary to determine any permitting requirements.
- *HAIR SNARES.* Hair snares are devices made of carpet attached to a small (about 4x4 inches) piece of wood that is nailed to a tree approximately two feet above the ground. The device may be modified by attaching a piece of Velcro. The hair snare is then "baited" with commercially available animal scent that lures the target animal to the snare. The scent induces rubbing on the snare, and hairs of the animal are left on the device for later identification. This method is appropriate for identifying the presence of large carnivores, such as coyote and fox, and it requires a knowledgeable biologist with the ability to identify large carnivore hairs.
- *HAIR SNARE OR TRACK TUBES*. Hair snare tubes are tubes with Velcro inserts used to snare the fur of small mammals passing through them for identification and analysis. Track tubes are covered with a surface that will leave impressions of animal tracks. These tubes can be baited, usually with food, which induces the animal to enter the tube. Similar to a regular hair snare, the use of hair snare tubes requires a knowledgeable biologist with the ability to identify small mammal hairs. City, state and possibly federal scientific collection permits would be required to use this sampling method depending on the property where the research is conducted, and a NYSDEC License to Collect or Possess would likely be required for trapping activity. Consultation with relevant agencies is necessary to determine any permitting requirements.

- *OWL PELLETS.* Owls are known to roost in certain areas. If owls are foraging on the site and their roosts are known, their pellets can provide a source of local small mammal's skulls and bones that can be sorted and identified. This technique requires knowledge of the foraging range of the species of owl in question in order to determine whether the prey could have been captured off-site.

- *CALL PLAYBACK.* Call playback is usually used to survey for birds, but it can also be used for coyotes. This method entails playing recordings of calls or songs and listening for a response. The call or song can be of the species being surveyed or of another species that is expected to elicit a call from the species being surveyed. Calls are generally played for three minutes followed by a one-minute listening period. Examples of uses of the call playback technique include, but are not limited to, the following:

- *DIURNAL RAPTOR SURVEYS.* Recordings of selected hawks and owls can be played at call stations to stimulate diurnal raptors to respond. Call stations for hawks (Cooper's, red-shouldered, northern goshawk, and sharp-shinned) are surveyed from sunrise to about midmorning. Calls used at hawk stations should include the great horned owl because hawks often respond to this call. The barred owl call can also be played in the early morning, as this species often responds during these hours.

- *NOCTURNAL RAPTOR (OWL) SURVEYS.* Recordings of owl calls can be played to stimulate owls to respond. Call stations for owls are surveyed from sunset to early morning using specific calls for the species being surveyed.

- *MARSH BIRD SURVEYS.* Marsh birds are surveyed during the evening and at night. During these surveys, playback recordings of American bittern, least bittern, black rail, sora rail, Virginia rail, pied-billed grebe, sedge wren, clapper rail, and marsh wren should be played, either from a canoe or on foot.

- *TURTLE TRAPS.* Turtle traps are traps with funnel-shaped entrances that minimize the ability of the animal to exit the trap. It can have wings or leads to draw the animal into the trap. Turtles traps set in water should be staked so that part of the trap is above water to prevent drowning of the animal. Like other live trapping devices, these traps must be monitored at frequent intervals to prevent undue stress or starvation of the trapped animal. City, state and possibly federal scientific collection permits would be required to use this sampling method depending on the property where the research is conducted, and a NYSDEC License to Collect or Possess would likely be required for trapping activity. Consultation with relevant agencies is necessary to determine any permitting requirements.

ADVANCED TECHNIQUES

Advanced survey techniques for fish and wildlife studies are generally not required for CEQR evaluations. However, under unique circumstances, they may be the best way to determine the presence, movements, and habitat use of a particular species if such information is necessary. Examples of some advanced techniques include radiotelemetry, banding, marking, bat surveys, mist netting, and nest surveys/counts. These methods would generally not be allowed for federally threatened or endangered species.

- *RADIOTELEMETRY.* Radiotelemetry involves attaching a radiotransmitter to an organism and using a receiver to detect radiofrequencies emitted by the transmitter. This technique is an efficient method to locate an individual, track its movements, and determine its habitat usage and home range. Radiotelemetry can be used to determine if a TES or species of special concern identified outside the project area moves into the project area, thereby subjecting it to project-related effects. This technique is also especially useful for determining corridors used by individuals to move to or from a project area or specific habitat (such as a

nesting site, overwintering site, foraging area, etc.). However, this technique is very expensive and thus is rarely applicable for CEQR evaluations. City, state and possibly federal scientific collection permits would be required to use this sampling method depending on the property where the research is conducted, and a NYSDEC License to Collect or Possess would likely be required for trapping activity. Depending on the species of interest, federal auxiliary marking permits may be required. Consultation with relevant agencies is necessary to determine any permitting requirements.

- *BANDING.* Banding can be used for birds or bats and consists of attaching a circular band with a unique identification code to the leg (or neck for long-necked birds) of the captured organism. When the organism is recaptured, it can be identified to the individual. Banding procedures are generally used to determine long distance movements and usually have little practical use for CEQR evaluations. However, in unique circumstances, banding may be used to determine local movements and population estimates. This technique is time consuming, and its usefulness should be considered carefully prior to implementing it. City, state and possibly federal scientific collection permits would be required to use this sampling method depending on the property where the research is conducted, and a NYSDEC License to Collect or Possess would be required for trapping activity, as would a federal bird banding permit from the USGS-Bird Banding Laboratory. Consultation with relevant agencies is necessary to determine any permitting requirements.

- *MARKING.* Marking encompasses any method to attach a unique identification number or other code to individual fish, amphibians, reptiles, and mammals. Marking for these organisms can take the form of tagging, shell notching, painting, toe clipping, branding, body markings, and other methods. Marking studies are generally used to determine local movements, estimate local population size/density, and to avoid counting the same individual more than once. City, state and possibly federal scientific collection permits would be required to use this sampling method depending on the property where the research is conducted, and a NYSDEC License to Collect or Possess would likely be required for trapping activity. Depending on the species of interest, federal wildlife marking permits may be required. Consultation with relevant agencies is necessary to determine any permitting requirements.

- *BAT SURVEYS.* Surveys for bats are difficult and time consuming and should not be necessary for CEQR evaluations except under very exceptional circumstances. To survey for bats, bat detectors, mist netting, radiotelemetry, and searching underground areas, tunnels, mines, old barns, and attics, and other habitat are used. City, state and possibly federal scientific collection permits would be required to use this sampling method depending on the property where the research is conducted and the method used, and a NYSDEC License to Collect or Possess would be required for trapping activity. Depending on the species of interest, federal auxiliary marking permits may be required. Consultation with relevant agencies is necessary to determine any permitting requirements.

- *MIST NETTING.* Mist nets are nets used to capture birds and bats. They are made of a fine threaded material that is difficult to see and are placed in areas through which birds and bats are known to travel. Birds and bats are captured in the net and removed by field personnel for identification and/or banding. Mist netting can cause significant stress to an animal, especially if the animal is left in the net for long durations. Thus, it is necessary to monitor the net at frequent intervals, making this method very time consuming. In addition, significant training and experience are required. Although this method is sometimes useful for breeding bird surveys and movement studies, this method would not normally be used for CEQR evaluations and should be avoided unless specifically required. City, state

and possibly federal scientific collection permits would be required to use this sampling method depending on the property where the research is conducted, and a NYSDEC License to Collect or Possess would be required for trapping activity, and additional federal permits may also apply. Consultation with relevant agencies is necessary to determine any permitting requirements.

- *NEST SURVEYS/COUNTS.* Nest surveys or counts entail physically counting and/or monitoring bird nests to obtain information on productivity and territoriality. These types of surveys are often labor-intensive and time consuming and require significant training in identifying nests. In addition, nests are usually very difficult to identify correctly. Therefore, this technique should only be used when necessary and only for those species whose nests are easily identified.