Non-Game Species and Their Habitat Needs in the Driftless Area

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1. The Driftless Area has some of the richest species diversity of the Midwest...not combining habitat for other species utilizing the riparian corridor (than trout) is a missed opportunity.
2. Consider using the Nongame Wildlife Habitat Guide "Decision Matrix" to determine under what conditions the major non-game habitat features are most likely to provide benefits for various non-game species.
3. Incorporating non-game habitat at the same time that construction equipment is being used for trout/stream restoration projects is efficient and cost-effective.
4. The Nongame Wildlife Habitat Guide contains a detailed Monitoring Section. We strongly encourage you to monitor your projects to determine if adding these non-game habitat features is producing the desired results.
5. The Nongame Wildlife Habitat Guide contains more than 20 habitat features to consider for your project, and they are all ready to go in an NRCS practice design format.

Amphibians | Reptiles | Birds | Hibernaculum | Vertical Nesting Bank | Instream Structures | Riparian | Restoration

Fig. 1. The Driftless Area is a dissected landscape with ridges and valleys, farmed uplands and floodplains, and forested slopes. There is an active stream restoration community in the region.

The Driftless Area, located in the heart of the Upper Mississippi River basin, is a geographically distinct 24,000-mi^2 area primarily in southwestern Wisconsin and includes areas of southeastern Minnesota, northeastern Iowa and extreme northwestern Illinois. This area is interlaced with more than 1,200 streams (more than 6,000 river miles) that spring from the underlying limestone bedrock. This area includes very steep topography with elevations ranging from 603 to 1,719-ft. The peculiar terrain is due to its having escaped glaciation during the last glacial period (approximately 10,000 years ago).

The streams and riparian habitats of the Driftless Area suffer from a history of human disturbances. Land use practices have led to extensive erosion and subsequent sedimentation of the watersheds in this region. The steep topography of the region has exacerbated these human influences. Across the region, hundreds of miles of spring creeks have been inundated with soils and fine sediment, resulting in degraded water quality, increased stream temperatures, damage to aquatic habitat, and altered watershed hydrology (1–3). For over fifty years conservationist and conservation organizations have been working to improve Driftless Area streams by stabilizing streambanks and incorporating habitat for trout (4). Each year federal, state and county conservation agencies spend millions of dollars to stabilize streambanks and create habitat for trout (Fig. 1). However, past stream restoration projects in the upper Midwest have often failed to incorporate habitat for non-game species such as amphibians, birds, invertebrates, mammals and reptiles, primarily because of a lack of knowledge about those species' habitat needs. Developing habitat for other non-game species while construction equipment is being used for stream restoration projects is efficient and cost-effective. Not combining habitat for these species is a missed opportunity.

Having a better understanding of what kinds of nongame wildlife live in your project area and a basic understanding of their life history is necessary to create a better project. A good place to start gathering information on what nongame species would benefit from additional or improved habitats is by reviewing your states Wildlife Action Plan. All of the states in the Midwest have developed Wildlife Action Plans identifying natural communities and their associated Species of Greatest Conservation Need (SGCN) (low and/or declining populations that are in need of conservation action). From this you can generate a target species list for your region to help you refine your species list. Trout Unlimited has also

Statement of Interest

Incorporating habitat elements for non-game species into stream restoration projects can increase the reach of a project by benefiting a wider variety of species and, therefore, opening the doors to additional sources of project funding. We have found additional funding sources and partners for our projects by addressing the needs of other riparian critters early on in the project design.

This chapter was reviewed by Anonymous.

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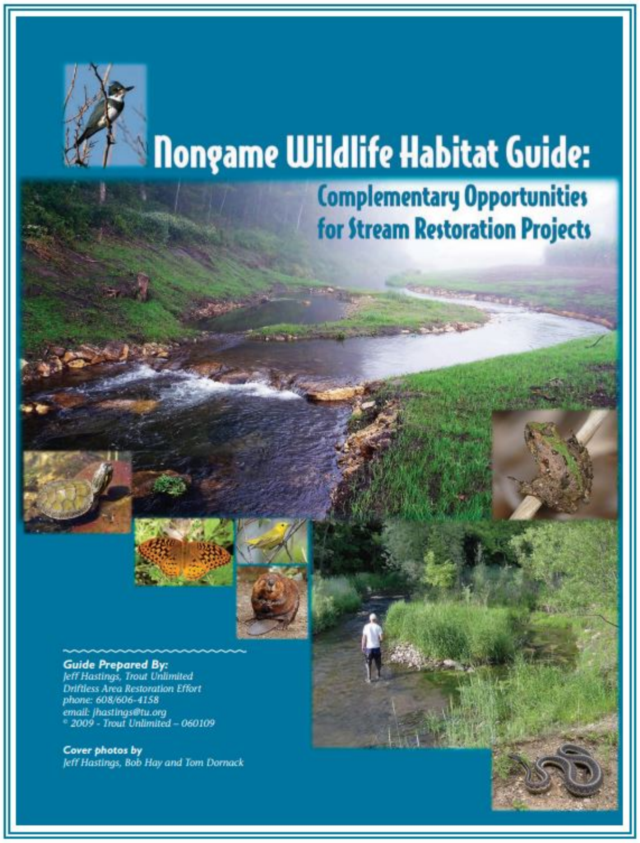

Fig. 2. Nongame Wildlife Habitat Guide: Complementary Opportunities for Stream Restoration Projects.

created a generalized target species list in their Nongame Wildlife Habitat Guide: Complementary Opportunities for Stream Restoration Projects (5) (Fig. 2). Another great resource produced by Partners in Amphibian and Reptile Conservation (PARC) in their Habitat Management Guidelines for Amphibians and Reptiles of the Midwestern United States, Technical Publication HMG-1, 2nd Edition (6). It will be helpful to then obtain a more precise list of species that are likely to exist in your more immediate area by contacting local species experts in your area, such as biology departments at local colleges and universities and Department of Natural Resources (DNR) staff. These folks may also be able to put you in touch with local non-agency species experts.

NOTE: Your target species list should also include common wetland, riparian or aquatic nongame species.

The Trout Unlimited publication provides information about the habitat needs of a variety of upland, riparian and wetland/aquatic non-game species and describes a number of management practices that can benefit them. By integrating some of these practices into your project, where appropriate, you may be able to make a positive contribution toward increasing the carrying capacity of instream, wetland, riparian and upland habitats for nongame birds, herptiles, invertebrates, mammals and possibly nongame fish. This is Trout Unlimited's second edition of this Nongame Wildlife Habitat Guide and has been modified to help project proponents better determine whether any habitat feature is more likely to

Fig. 3. Backwater wetland with basking logs.

accomplish it intended purpose within the immediate habitats and within the surrounding landscapes. A habitat, species, and landscape matrix is also provided in the guide to help you determine which habitat features are most likely to benefit species on your target list. For example, adding wetland scrapes within an intact riparian corridor is likely to benefit population of common amphibian species in your area and may also improve populations of SGCN species like the Northern Cricket Frog *Acris crepitans* and the Pickerel Frog *Lithobates palustris* (Fig. 3). On the other hand, adding wetlands scrapes within an active pasture may have more limited benefits for amphibians. Wetland scrapes in a pasture may be even less likely to succeed if the surrounding landscape is comprised primarily of row crops. This improvement to the guide will help project proponents develop plans that only incorporate habitat features that are likely to succeed and should allow state and federal agency staff to make better informed decisions within the project reviews and approval process.

Nongame Wildlife Life History Consideration

Invertebrates (*protozoa, annelids, mollusks, arthropods, crustaceans, arachnids and insects*). This exceedingly diverse group of species is the backbone or base of the animal food chain and is perhaps the most important as a result. Providing for the life history of such a broad range of species may be best accomplished by attempting to provide many of the recognizable macro- and micro-habitats that naturally occur within an intact natural riparian community that is similar to the desired outcome of your project restoration area. Providing standing and flowing water habitats with varied depths, temperatures, substrates and structures may be the best way to maximize aquatic invertebrate biodiversity. The rest of the fine habitat features are likely to be naturally provided over time. Riparian and upland habitats should have varied vegetative structure and be planted with a diverse mix of species. To achieve this, we are suggesting seed mixes that contain both native and exotic species (grasses and forbs) that have the greatest likelihood of achieving a varied herbaceous vegetation layer once established. We are purposefully including some exotic plant species because it is understood that most of these properties will not receive management. The establishment and maintenance of a diverse native planting typically requires significant management, especially in the early years, if a diverse plant diversity and structure is to be achieved. Where a project is attempting to improve conditions for one or more of the SGCN target invertebrates, such as a butterfly, seed mixes can include host plant seed as appropriate. Having knowledge about these species and their specific habitat requirements, host plants and soil types needed must be known to determine if you can accommodate these species within your project area. Other terrestrial microhabitat structures for invertebrates include flat rocks on the surface, embedded rocks and varying types and sizes of down woody debris.

Amphibians (Class: *Amphibia*). Amphibians, such as frogs and salamanders are cold-blooded animals, most of which metamorphose from a larval form to an adult form, leading double lives – one in water and one on land (7, 8). Most species lay their eggs in standing water but have varied habitat preferences on land, ranging from open canopy grasslands to dense forests. Suitable breeding habitat is critical to their long-term survival. Amphibians in this region generally breed during three peak phenology windows, although overlaps often occur between these windows. The early spring breeding frogs mostly rely on ephemeral wetlands or ponds that do not support predatory fish. Successful recruitment for amphibians occurs in ponds that support water at least 4-5 months during spring and summer. Most of the Driftless Area's terrestrial salamanders breed in water in April and their larvae transform from mid-July through early September. They require longer water persistence than the early breeding frogs. The middle breeding frogs, peaking from late April through early June, also prefer fishless environments. Because they breed later in the season, they also require water presence well into August. Recruitment for these frogs is best in fishless waters. The third phenology involves three frogs that breed from late May through early-August. Of these, two species have overwintering larvae (tadpoles) and require permanent waters. The third species, the endangered northern cricket frog, breeds in semi-permanent and permanent water but the larvae transforms in the same season. All three of these species have developed chemical or behavioral means by which to reduce predation rates by fish.

Frogs and salamanders have thin, semi-permeable skin that needs to remain moist. Therefore, upland habitats must provide microhabitats that allow them to avoid damaging water loss. Downed woody debris or healthy duff layers often supply this microhabitat. Adult salamanders often live underground or under large woody debris on land outside of the breeding period.

Vernal pools and ponds were not historically abundant in the Driftless Area due to steep topography and narrow valleys. The impacts of over-grazing and early agricultural practices have significantly altered most stream drainages in this area, often resulting in broader floodplains. These floodplains provide managers with the opportunity to create and restore wetlands adjacent to these streams.

Amphibians overwinter in a variety of ways, some overwinter underwater to avoid freezing. Others burrow below the frost line to avoid freezing. The endangered northern cricket frog is unique in it overwintering requirements. They cannot withstand freezing nor can they withstand being underwater for days. Because they cannot effectively burrow to escape freezing, they require specialized microhabitats where they can avoid freezing, yet still retain moisture. Cracks in damp unfrozen soils near the shoreline or near seeps, crayfish burrows and other microhabitats are essential to this species' persistence. Research is needed to determine how to manage these critical microhabitats and to create and maintain them. The lack or loss of these microhabitats may be major limiting factors for cricket frogs (Fig. 4).

Fig. 4. Northern cricket frog in overwintering crack. Credit: A. Badje.

Reptiles (Class: *Reptilia*). Reptiles for this guide include turtles and snakes (Fig. 5). They are cold-blooded animals with scales covering most or all their skin as opposed to having smooth moist skin like amphibians. Terrestrial and most aquatic reptiles lack the ability to internally regulate their body temperatures but instead rely on external influences to establish their body temperatures. As such, they rely on ambient air and ground temperatures and sun and shade to thermally regulate their body temperatures. Of all cold-blooded species, reptiles have some of the highest thermal preferences. As a result, habitat conditions must provide reptiles with opportunities to adequately thermo-regulate. Varied habitat structure that offers a range of canopy conditions and that favors open canopy conditions is important for reptiles. Reptiles also require overwintering microhabitats underground or underwater to avoid freezing during the winter.

Aquatic turtles require basking surfaces to increase body temperature. This helps them digest food, acquire Vitamin D and maintain shell health. Gravid females bask in spring to elevate their temperatures to allow for timely egg develop. Adult turtles will commonly emerge from overwintering habitats as soon as the ice melts (9). Turtles that overwinter in riverine settings often migrate in early spring to adjacent wetlands and shallow ponds. These habitats warm up more quickly in spring, providing better conditions for foraging on invertebrates and aquatic vegetation. Shallow standing water is important in this region by helping turtles complete their annual life cycle (10).

Snakes are primarily terrestrial animals (Fig. 6). They have relatively high thermal preferences and prefer open canopy habitats. The most commonly encountered snake along streams in the Driftless Area is the Northern Watersnake *Nero-*

Fig. 5. Blanding's Turtle. Credit: Dan Nedrelo.

Fig. 6. Snakes are cold-blooded and rely on air and ground temperatures to regulate body temperatures. Credit: Dan Nedrelo.

dia sipedon. It feeds on a combination of amphibians, crayfish and fish. Gartersnakes *Thamnophis spp.* are often common in streamside riparian habitats and amphibians are their primary prey. Several other snake species are found in streamside communities in this area but are less dependent on it. Many of these snakes are communal denning, meaning that they congregate to overwinter (9). In areas where natural den sites are limited or absent, artificial structures can be created to meet their overwintering needs.

Birds (Class: *Aves*). Birds are warm-blooded species that maintain stable internal body temperatures regardless of external influence. Because winters in the Midwest impact food availability for many birds, they migrate south to take advantage of warmer climates where access to food resources is not limited by cold temperatures, ice or frozen soils. This includes many of the riverine and wetland associated birds. Most water-associated nongame bird species fall into the category of being insectovores (small birds that eat invertebrates including insects), are piscivores (eat primarily fish) or are more general predators, eating a wide variety of prey including insects, fish, amphibians, reptiles and small mammals along with wetland/aquatic vegetation and seeds. A wide variety of birds can be found along stream corridors, but are not dependent on these habitats alone.

Shallow wetlands, low gradient shoreline of ponds, and mud flats and backwater areas along streams provide excellent foraging areas for wading birds. Perches over the water are important for a variety of insect eating birds such as Eastern Kingbirds *Tyrannus tyrannus* and for fish eaters like the Belted Kingfisher *Megaceryle alcyon*. Dead trees provide perching areas for hawks and other birds and can provide structure for nesting and foraging. Vertical banks can be important nesting habitats for Bank Swallows *Riparia riparia* and kingfishers (11). Varied habitat structure (trees, brush and grasslands) in riparian habitats can provide a variety of nesting opportunities.

Mammals (Class: *Mammalia*). Mammals are warm-blooded animals with varying degrees of cold temperature tolerance. Mammals of the Midwest do not migrate seasonally. Many remain active year-round by growing a denser coat of fur while others hibernate underground or in protective structures (e.g. hollow trees). A few mammals are highly associated with riverine environments, such as Muskrats *Ondatra zibethicus*, American Beaver *Castor canadensis*, North American River Otter *Lontra canadensis*, American Mink *Neovison vison*, and Short-Tailed Weasels *Mustela erminea*. Many other mammals from shrews to bears utilize riverine habitats.

Beavers are unique among all of the animals found in riverine communities because they create habitat to improve access to their food supply (12). Beavers provide extremely valuable shallow water habitats for a wide variety of amphibians, birds, invertebrates, mammals and reptiles. However, beavers also create problems for streams by impounding water that warms the stream, blocks upstream migration of fish and can impacts instream habitats. As a result, they are often controlled on cool and cold-water streams to minimize their damage to fish and instream habitats (13). However, stream restoration specialist can create habitats that provide similar conditions for the many nongame species that benefit from shallow impoundments and they can do this without having negative impacts on the stream itself. These alternative habitats can help stabilize and improve local biodiversity and add to the carrying capacity of the area.

Riparian and Upland Area Habitat Feature that Benefit Nongame Wildlife

The following habitat features are designed to improve conditions for amphibians, reptiles, birds, invertebrates and mammals:

Wetland Scrapes and ponds.

- Create where soils have low permeability or where the water table is close to the surface. Placement in an existing wetland must be pre-approved by your state's natural resources agency. These are typically only approved where the wetland is dominated by monotypic exotic vegetation or where other disturbances have grossly simplified wetland functions.

- Ephemeral ponds and scrapes should hold water for at least 4-5 months (early spring through mid-summer) and be less than 30-in (76-cm) deep (Fig. 7).

- Permanent ponds should have varying depths. Ponds should be 6-ft (1.8-m) in the deepest spot to allow for overwintering by amphibians, invertebrates and turtles. Note. These ponds could support fish populations.
- Design scrapes and ponds with irregular shorelines to increase shoreline to area ratios (not bowl shaped)
- Scrapes and ponds should have varied but generally low gradient slopes (6-8 to 1).
- If more than one pond is constructed, vary their distance to the stream. Ephemeral scrapes are best placed where they will flood only during high water events or surface water runoff.
- Isolate ponds from unwanted sources of pollution such as runoff from roads or sloped pastures.
- Add brush and large woody debris to ponds for egg deposition, basking and cover: 1) Basking logs should extend at least 5-ft (1.5-m) out from shore to minimize ambush by terrestrial predators. Include trees with branches above the water for birds, 2) Logs can vary in diameter from 6-in (15-cm) and up and should be anchored into the bank to keep them positioned so turtles and other species can easily access then from the water, 3) Use logs that have been dead for at least one year as green logs are heavy and tend to sink.

Terrestrial Cover Objects.

- Place large woody debris and large rocks adjacent to ponds and along travel corridors for cover and as elevated basking spots. Over time, large woody debris often supports abundant invertebrate life that is valuable to a wide variety of species.

Vegetation and Buffer Strips.

- Plant mixes of short grasses and low growing forbs around ponds and scrapes and in riparian habitats as buffer strips (minimum of 200-ft, or 60-m) to improve thermal conditions for herptiles while providing habitat for a variety of other nongame wildlife and their prey and to protect water.
- Connect buffer strips to suitable upland habitats to improve/restore habitat connectivity with breeding sites.

Snake Hibernacula.

- Several species of snakes in the Driftless Area overwinter communally. These include the common gartersnake, Decay's brownsnake, eastern milksnake, northern red-bellied snake, northern watersnake, prairie ring-necked snake, timber rattlesnake and the western foxsnake. These species may all overwinter together, in some combination or separately as a species depending on the surrounding habitats and the availability of suitable hibernacula. Snakes are known to migrate up to two miles (3.2-km) from their summer range to their hibernation site, but the migration is often shorter. Species may have different overwintering microhabitat preferences even when they use the same hibernaculum, so designing a one-size-fits-all hibernaculum is easier said than done. Two key elements are critical for snakes to overwinter successfully; conditions must prevent snakes from freezing and sufficient moisture is required to prevent damaging water loss during the long period they remain underground. Many studies have shown the lack of adequate hibernacula to be a limiting factor in the success of snake populations (14). The hibernaculum design and specifications below were developed by gaining experience with the design of several old and abandoned dug wells that support several of the communal denning snakes (Figs. 8, 9).

Vertical Bird Nesting Banks.

- Reconstruct vertical nesting banks away from the streambank but in close proximity to it (Figs. 10, 11). This can be done by shaving back existing banks or by creating soil mounds that have a vertical face on the streamward side. Stabilize the rest of the mound with cool season grasses such as Kentucky blue grass.
- **NOTE**: Place netting over eroding banks where bank nesting is known or expected to occur prior to the nesting season in the year that the restoration will occur.

Riparian Trees.

- Leave some trees along the riparian corridor but not at the immediate shoreline for bird use. Where trees only occur at the shoreline and must be removed due to threats to streambank stabilization, replant native trees back from the bank to restore nesting and perching sites.

Instream Habitat Features that Benefit Nongame Wildlife

Turtle Hibernacula.

- The structures used for overwintering by many cold-blooded species are called *hibernacula*. Silts are often deposited on the downstream side of trees that have lodged adjacent to the streambank. The large trunk or roots of a tree slow the water down and allow silt to settle and accumulate immediately downstream, usually against the bank. Turtles locate these deposited fine silts and bury themselves in for the winter. Unfortunately, some of the worst streambank erosion occurs adjacent to these unstable trees and roots. As discussed earlier, an unanchored tree may be good for a year or more but eventually moves downstream during flood events. A more permanent artificial overwintering structure has been developed to create similar sediment traps and can be found in the Nongame Wildlife Habitat Guide. These structures are strategically placed under the bank immediately downstream of flow deflectors placed on the upper inside end of bends. These structures are specifically designed for Common Snapping Turtles *Chelydra serpentina* but may occasionally be used by other turtles. The turtle hibernacula, made of a hard wood, will be virtually rot resistant once it is placed under water and not exposed to air. The current design uses 2-in (5-cm) thick rough oak, 8-ft (2.4-m) long, which is what we typically use for building our habitat structures.

Fig. 7. Off-channel ponds with basking log. Credit: D. Dauwalter.

Fig. 8. Construction of a hibernaculum as part of a stream restoration project.

Fig. 9. Post-construction hibernaculum.

Large Cover Rock or Woody Debris.

- Adding large boulders, or anchored woody debris will create pockets of slack water immediately downstream of these structures in deep pools, providing slack water microhabitats which can be used by turtles for overwintering. These features can also benefit trout by creating areas of lower flows thereby reducing the amount of energy needed by trout to feed. Vortex weirs are often created utilizing rocks, however in smaller streams wood can be used as well.

Cross Channel Logs.

- Cross channel logs can also be used to create deep pools (Fig. 13). Care must be taken to keep water from undermining the log and losing the plunging effect. Packing rock of different sized on the upstream side of the log will help reduce the chance of undermining.

Basking Logs.

- Basking helps turtles regulate their body temperature and aids in digestion. Vitamin D is important for the uptake of calcium from their food and is important for shell development and maintenance. Basking allows the shell to dry, inhibiting bacterial and fungal growth and assists some species with the shedding of scutes (the keratin plates overlaying the shell bones)(14). Creating permanent basking logs, or escape logs, is a simple task with an excavator (Fig. 14). Logs can be anchored into the bank and placed so that they sit just above the water surface during normal flows where they would not significantly obstruct water flow.

Fig. 10. Recently completed vertical nesting bank constructed as part of a stream restoration project.

Fig. 11. Vertical nesting bank in background. Note its location set back from the stream channel.

Large Cover Rocks/Boulders.

- Another practice often used to create additional habitat for trout is placing large boulders in deep water on straight stretches of stream. Eddies behind the large boulders in the center of the channel will also provide microhabitats for over wintering turtles.

Rock Deflectors.

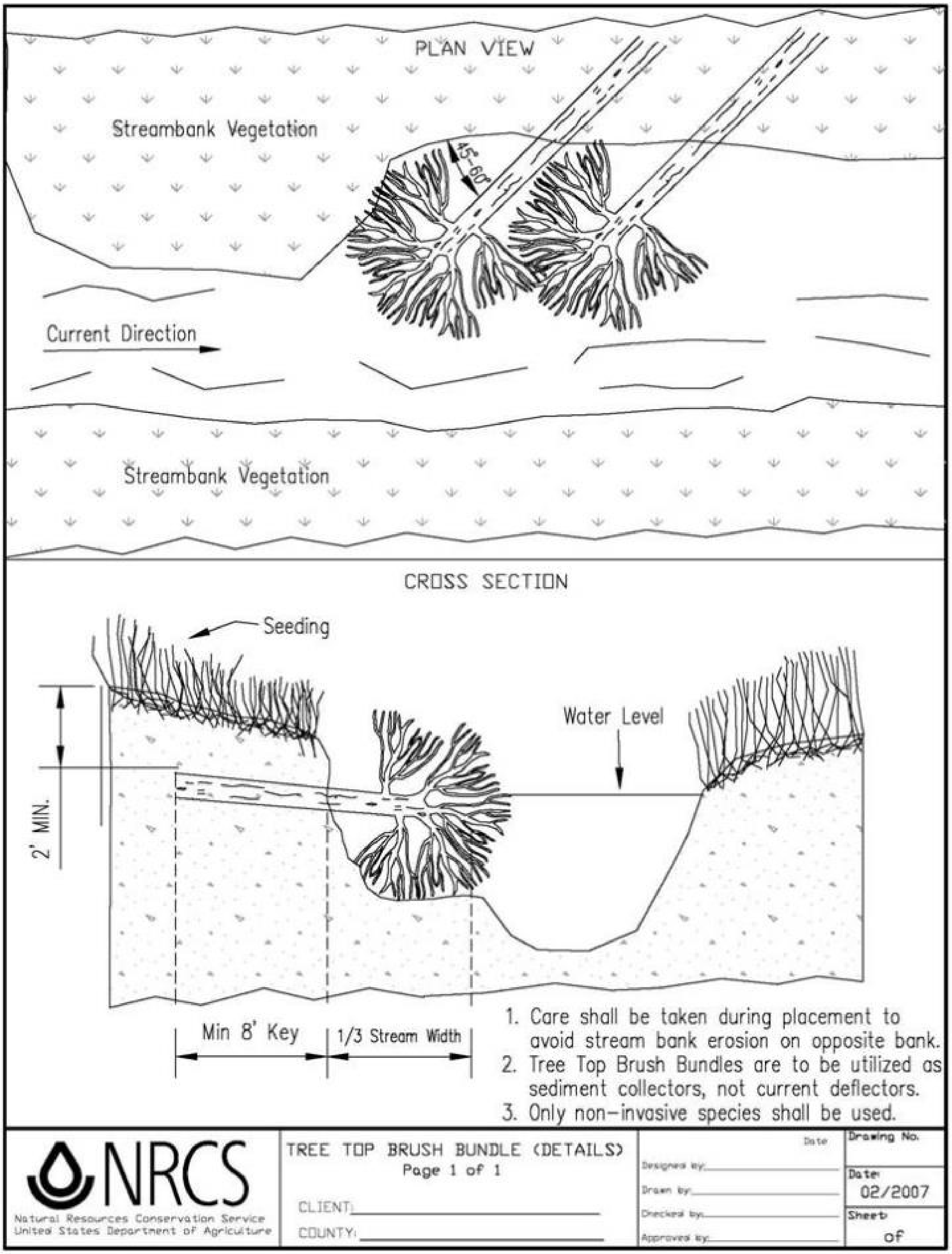

Fig. 12. Northern Water Snakes forage along stream and river banks. Providing in-stream habitat such as Tree Top Brush Bundles could provide valuable habitat. This design, and many more have been formatted on NRCS standards and designs and approved for Environmental Quality Incentives Program dollars, and can be found in the Nongame Wildlife Habitat Guide.

Fig. 13. Crosslog used to create pool habitat as part of a stream restoration project.

Fig. 14. Basking log at backwater confluence on Coon Creek, Wisconsin. Credit: D. Dauwalter.

- Rock deflectors typically installed to kick water flow from one bank to the other in-time will also provide shallow sediment flats on the downstream side. These provide habitat for burrowing invertebrates and foraging habitats for small wading birds. Add rocks to riffles that sit just above normal stream flow. These can serve as insect foraging sites for the Louisiana Waterthrush *Parkesia motacilla*.

Brush Bundles and Root Wads.

- This woody material can provide bank stabilization, overhead cover for trout and substrate for invertebrates (Fig. 12).

Oxbows.

- Connecting and even enlarging old oxbows to the stream will support tadpoles, frogs, turtles and forage fish. An oxbow lake is a U-shaped lake water body formed when a wide meander from the mainstem of a river is cut off to create a lake. Coldwater predatory fish will usually avoid these refuge areas because of the higher temperatures created by their shallow water and little or no flow.

Fig. 15. Side channel (left) on Trout Run, Minnesota. Note also the basking log. Credit: D. Dauwalter.

Vortex Weirs.

- A "Vortex Weir", constructed by placing large rocks in the shape of a "V", with the point of the "V" pointed upstream with large boulders in the pool will provide microhabitats for over wintering turtles and trout. As water flows over the rock it is directed to the center of the stream and the action of the water falling over the rock scours out a deep permanent pool.

Side Channels.

- Side Channels (Fig. 15) connect to the stream but are slightly warmer in temperature and will provide additional microhabitats for frogs, forage fish and invertebrates, which in turn provide foraging habitat for streamside community snakes, turtles and wading birds.

Point Bars.

- Point bars allow for the deposition of sediment, creating shallow flats of mud or sand. These shallow sediments typically support low and sparse vegetation and are ideal for many frogs and shore land birds. This habitat feature is particularly important for Wisconsin's only endangered amphibian the northern cricket frog.

In order to maximize the likelihood of success of these additional habitat features, it will be important to eliminate, or restrict access to ponds and streams by livestock. Cattle crossing have been effective in stabilizing bottom substrates and reducing erosion and turbidity.

Monitoring Non-Game Habitat

A suite of monitoring protocols to assess nongame wildlife on larger projects that incorporate several to many of the habitat features listed in this guide can be found in the Nongame Wildlife Habitat Guide. The purpose of monitoring is to determine if the added nongame habitat features accomplish their intended purpose, to improve nongame diversity and relative abundances. For monitoring to have value, pre- and post-monitoring is necessary. Pre-monitoring provides a baseline of species and relative abundance that can be compared to post-project results. Monitoring for pre- and post-construction must be done similarly, following the same methods and level of effort. While this will not provide definitive results for all species, it will help managers and funding agencies make decisions about what habitat features are most beneficial. Over time, monitoring results should help refine what practices to continue promoting and which to drop. We strongly encourage you to monitor your projects to determine if adding these nongame habitat features is producing the desired effect (see Johnson, page 70).

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