# Natural Resources and Envirormental Overview of the The Ravenna Army Ammunition Plant With Thoughts On The Future

By:Tim Morgan, RVAAP Natural Resources Manager April 1996.

The Ravenna Army Ammunition Plant (RVAAP) is a 21,419 acre Army installation located in Northeastern Ohio. Approximately 90% of the RVAAP is in Portage County and 10% is in Trumbull County. The property was acquired by the then Department of War In 1939 and 1940 for the construction of the Ravenna ordnance Plant. The function of the plant was to load, assemble and pack large caliber projectiles and bombs for use in World War II. Over 200 families lost their homes and land for the ordnance Plant. These people contributed a part of themselves for the war effort, and the country owes them a debt of gratitude.

Much of the land area of the RVAAP is not occupied with buildings, and to the casual observer, looks like it's not in use. It would seem that the Government has a lot of unused acreage that could be put to "use.' Actually, the land is being used. Large tracts of land are needed as safety buffers (Known as quantity distance zones) when handling and storing explosives. The seemingly unused land is critical to the Army's use of the property. All explosives operations are limited by the distance to the perimeter fence and other structures. The load lines and storage magazines are all designed and spaced to meet specific quantity distance requirements. Explosives storage can not be mixed with other unrestricted land uses. All land uses at the RVAAP must be designed around the quantity distance zones. Most of the space that can be used is occupied or used for military training.

When the military fenced off this large parcel of land, their purpose was not to create a nature preserve. The fence was put in place for security and to protect the safety of the general public. Restricting access to the property had an interesting, and unintentional, side effect. over the last 55 plus years the RVAAP returned to a very large contiguous tract of relatively undeveloped land. This situation is unique to northeastern, and probably all, Ohio. The land that for so long has been off limits to the general public has turned into a treasure of biological diversity that would otherwise not exist.

The uniqueness of the RVAAP in the highly developed and fragmented world of Northeast Ohio in which we live today can not be understated. Not only is the RVAAP a large tract of federal land closed to development, but it is also, for all intensive purposes, inaccessible to the general public. This is unique for large federal and state holdings in Ohio. There are other large government land holdings, but they are fragmented and open to

carvings in the trees. The irony and saddness is that it took seven foot barbed wire fences tand restricted access military installations for such an area to exist.

The Army is required by a Federal Regulation to manage the natural resources on its lands. Natural resources management is guided by an Integrated Natural Resources Management Plan that. is based on an ecosystem management approach. 1. The natural resources are not managed solely for human consumption. They are managed for the good of the resources while allowing for some consumptive use. The RVAAP does not promote management that is money and resource intensive such as planting annual crops for animals. The RVAAP advocates sustainable management activities that can be perpetuated with minimal intervention. The current mission lends itself well to this task because there are large expansive areas that must be kept devoid of activity. The RVAAP in many ways is like a pristine wilderness. There are places where one can go and see and hear nothing but nature.

There are vast tracts of closed canopy timber that are home to many neotropical migratory birds, and acres and acres of reverting farm fields that are home to countless numbers of other birds. Spring time is like a continuous choir rehearsal of birds. A total of 143 bird species have been documented at the RVAAP. The sheer number of birds makes the most experienced birder stand in awe. other wildlife species are also abundant. There are 26 species of mammals, 31 species of amphibians and reptiles, 41 species of fish and 6 hybrids, 58 species of crayfish and molluscs, 37 species of dragonflies and damselflies, 58 species of butterflies, and 485 species of moths.

There are several rare species found at the RVAAP. There are no known federally listed threatened or endangered species on the RVAAP, but the federally listed endangered Indiana bat is a possible inhabitant. Below is a listing of the rare species found at the RVAAP.

**A. Federal candidate, Category 2**

1. Cerulean warbler, *Dendronica cerulea*
2. Butternut tree, *Juglans cinerea*

**B. State Endangered (1993 Inventory)**

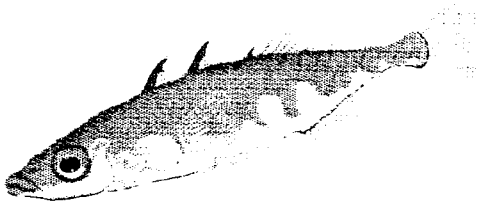
1. Northern Harrier, *Circus cyaneus*
2. Common Barn-Owl, *Tyto alba*
3. Yellow-bellied Sapsucker, *Sphyrapicus varius*
4. Mountain Brook Lamprey, *Ichthyomvzon greeleyi*
5. Graceful Underwing, *Catocala gracilis*

**D. State Potentially Threatened**

1. Gray Birch, *Betula Populifolia*
2. Round-leaved sundew, *Drosera rotundifolia*
3. Closed gentian, *Gentiana clausa*
4. Butternut, *Juctlans cinerea*
5. Blunt mountain-mint, *Pycnanthemum muticum*
6. Northern rose azalea, *Rhododendron nudiflorum* var. *roseum*
7. Large cranberry, *Vaccinium macrocarpon*
8. Hobblebush, *Viburnum alnifolium*
9. Fox grape, *Vitus labrusca*
10. Woodland Horsetail,*Equisetum sylvaticum*
11. Long Beech Fern, *Phegopteris connectilis* (*Thelypteris phegopteris*) (suspected)
12. Eel-grass,*Vallisneriaamericans* (suspected-)

**E. State Special Concern (ODOW or Heritage listing)**

1. Woodland Jumping House, *Napaeozapus insignis* (ODOW)
2. Solitary Vireo, *Vireo solitarius* (Heritage)
3. Sharp-shinned Hawk, *Accipiter striatus* (ODOW)
4. Sora, *Porzana carolina* (ODOW)
5. Virginia Rail, *Rallus limicola* (ODOW)
6. Four-toed Salamander, *Hemidactylium scutatum* (ODOW)
7. Smooth green snake, *Opheodrys vernalis* (Heritage)



Some wildlife species are too numerous and cause safety and environmental problems. The deer eat everything in sight and destroy plant communities and ecosystems that other animals need for survival, so their numbers are controlled through a hunting program. Beaver occasionally cause damage to roads and other facilities by their flooding activity. They're controlled only in areas where they cause damage. Raccoons are another concern. They are predators of many bird species and tend to get distemper when their numbers are high. Attempts are made to reduce their numbers by trapping when necessary. There are a few ponds that are open for public fishing. Each year a limited number of permits are issued through a random drawing. Lucky fishermen are assigned one week for fishing access to the RVAAP.

A total of 18 different plant communities have been documented at the RVAAP. These Include 410 native plant species and 11 non-native plant species. From the air the RVAAP looks like a huge forest Actually there's only about 16,000 acres of forest. There's several thousand acres of reverting farm fields that have enough tree seedlings In them to be considered forest. one would never know by walking through the RVAAP forests that 22 million board feet of timber have been harvested since 1940. The original forested acreage was only 5,000 acres. The sawtimber was cleared from this acreage in the 1940's to help build the plant. Since that time a highly controlled management program has allowed the forested acreage to triple. Timber harvesting is conducted to perpetuate ecosystems. The forest canopy closure is maintained in large tracts, smaller tracts are managed for the production of shade intolerant and mast producing species, and one large 1,100 acre area is not scheduled for harvesting. The numerous roads and field edges provide ideal growing conditions for blackberries and black raspberries, and many apple trees from old orchards are still alive today. There is also

one 90 acre grassland that's leased for the production of hay, and a 60 acre sugar maple woods leased for maple sugar production.

There's an area known as the Wadsworth Glen within the RVAAP which is the southern-most extension in Ohio of the White Pine-Hemlock-Northern Hardwoods Association. This area is composed of a 20 meter deep hemlock gorge. The gorge walls are made up of Sharon Conglomerate. The glen and the surrounding area lie within glacial ground moraine.

There are over fifty miles of streams and approximately 50 ponds on the RVAAP. Most of the ponds were made by beaver. Water quality tests that Used to be done in the 1980's indicated that the surface water leaving the RVAAP was of better quality than that coming in. The numerous beaver ponds and wetlands throughout the RVAAP filter the surface water and there are no septic systems or agricultural fields adding to ground and surface water pollutants. Approximately one third of the installation is wetlands Most of this acreage is in forested wetlands. There are also a lot of the typical marsh type wetlands.

The past production activities resulted in several environmental areas of concern or AOC'S. These AOC's are areas of known or potential contamination. They consist primarily of TNT contaminated soils and demolition areas. A lot of people think of a wasteland when they think of contamination. That's simply not the case at Ravenna. The average person can not even tell a contaminated area from an uncontaminated area. There are no dead spots or lifeless ponds and rivers. As a matter of fact many of the old settling ponds (used in the 1940's) support healthy fisheries, aquatic plants, and waterfowl. The designation of an area as an AOC does not necessarily mean that it is contaminated. Suspected sites are identified as well as known sites. Typical contamination is around the production facilities, and more specifically around the buildings and facilities where explosives were handled and processed. The Army is currently working with the Ohio EPA to determine the specific limits of the AOC's and develop clean up plans. The Army must complete this work no matter what they decide to do with the property. Chances are that the RVAAP will remain under Army control for some time until the clean up is complete.

The load lines, with the exception of limited operations during the Korean and Vietnam Wars and sporadic demilitarization jobs, have been silent at the RVAAP since the end of WW II. The RVAAP no longer has a mobilization mission for the production of projectiles and bombs. The production facilities are inactive, never to be used again, and the buildings stand like great dinosaurs of a lost age. The explosive storage facilities are currently still in use, but in this day of Cost cutting and limited funding their long term future use is unlikely. what will become of the RVAAP with no production mission and the potential loss of the storage mission? That's the big question. The Industrial Operations Command will no longer have a need for the RVAAP once they empty the ammunition storage magazines. Discussions are currently underway to transfer administrative control of the property from the U.S Army Industrial Operations Command (IOC) to the U.S. Army National

Guard Bureau (NGB).

The impacts of all of this on the natural resources Is unknown. environmental restoration is a long term and high cost program, and will resu in Army control and limited land use changes for some time. NGB use of t property will result in large portions of it remaining off limits to the gener public and will again inadvertently keep the property from being developed. The actual Impacts of increased training and training area development are unkno at this time. A lot of training can be done with minimal modifications current ecological conditions, but some changes are bound to be made facilitate expanded armor and aircraft training. The NGS will be required manage the natural resources and environment under the same regulations as t IOC, but where the IOC mission resulted in Inactivity in large expanses betwe mission operations, the NGB mission will result In more intensive use of the land. At this point in time, it looks like the Army will retain the property for use as a training facility and continue with the environmental restorat program and the management of the natural resources tailoring the train missions to the capabilities of the land.

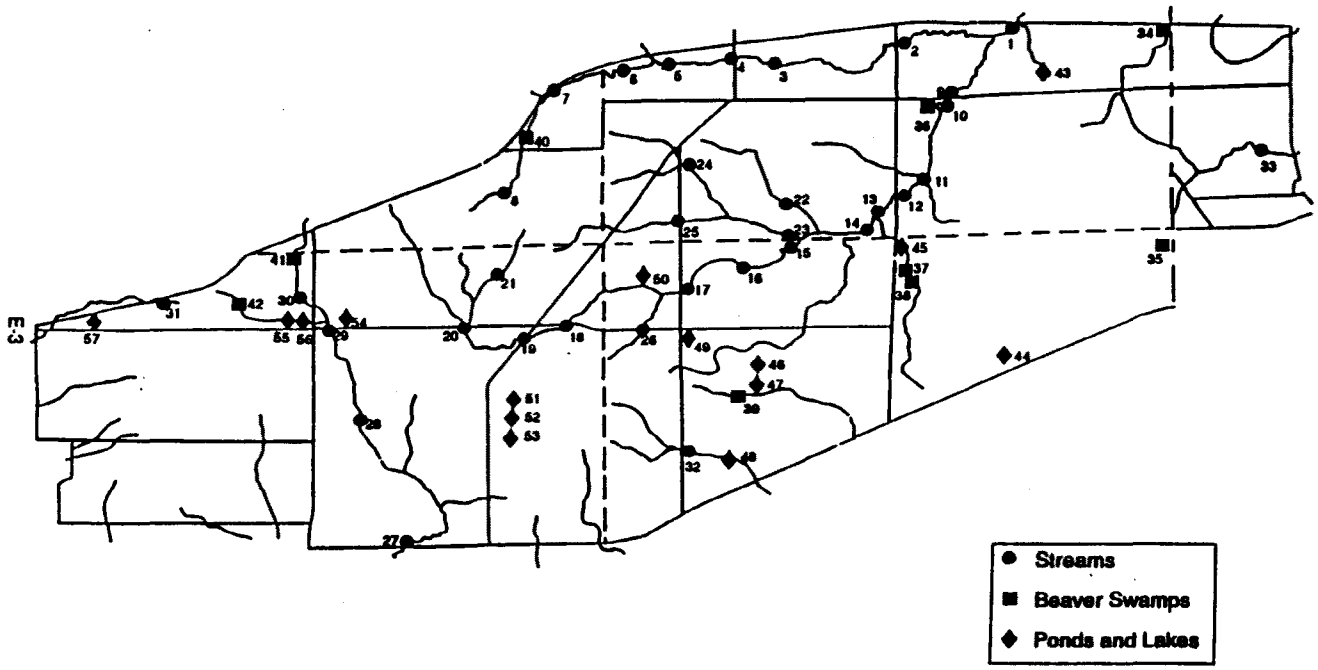



**Figure 1. Map of the fish sampling stations at Ravenna Arsenal.**

**TABLE 2. TOTAL SPECIES AND NUMBERS OF FISH COLLECTED ON THE RAVENNA ARSENAL.**

| | SPECIES | NO. |
|---|---|---|
| 1 | Mountain Brook Lamprey (*Ichthyomyzon greeleyi*) | 22 |
| 2 | Bowfin (*Amia calva*) | 2 |
| 3 | Gizzard Shad (*Dorosoma cepedianum*) | 2 |
| 4 | Rainbow Trout (*Oncorhynchus mykiss*) | 11 |
| 5 | Central Mudminnow (*Umbra limi*) | 259 |
| 6 | Grass Pickerel (*Esox americanus vermiculs*) | 298 |
| 7 | Golden Redhorse (*Moxostoma erythrurum*) | 8 |
| 8 | Northern Hog Sucker (*Hypentelium nigricans*) | 151 |
| 9 | White Sucker (*Catostomus commersoni*) | 702 |
| 10 | Spotted Sucker (*Minytrema melanops*) | 26 |
| 11 | Common Carp (*Cyprinus carpio*) | 19 |
| 12 | Golden Shiner (*Notemigonus crysoleucas*) | 313 |
| 13 | Blacknose Dace (*Rhinichthys atratulus*) | 1036 |
| 14 | Creek Chub (*Semotilus atromaculatus*) | 2362 |
| 15 | South. Redbelly Dace (*Phoxinus erythrogaster*) | 742 |
| 16 | Redside Dace (*Clinostomus elongatus*) | 20 |
| 17 | Striped Shiner (*Luxilus chrysocephalus*) | 190 |
| 18 | Sand Shiner (*Notropis stramineus*) | 1 |
| 19 | Silverjaw Minnow (*Notropis buccatus*) | 896 |
| 20 | Fathead Minnow (*Pimephales promelas*) | 381 |
| 21 | Bluntnose Minnow (*Pimephales notatus*) | 1010 |
| 22 | Central Stoneroller (*Compostoma anomalum*) | 729 |
| 23 | Hybrid X Minnow (HYBRID) | 3 |
| 24 | Channel Catfish (*Ictalurus punctatus*) | 7 |
| 25 | Yellow Bullhead (*Ameiurus natalis*) | 62 |
| 26 | Brown Bullhead (*Ameiurus nebulosus*) | 15 |
| 27 | Black Crappie (*Poxomis nigromaculatus*) | 19 |
| 28 | Rock Bass (*Ambloplites rupestris*) | 38 |
| 29 | Largemouth Bass (*Micropterus salmoides*) | 309 |
| 30 | Warmouth SF (*Lepomis gulosus*) | 91 |
| 31 | Green Sunfish (*Lepomis cyanellus*) | 1333 |
| 32 | Bluegill Sunfish (*Lepomis macrochirus*) | 1807 |
| 33 | Pumpkinseed Sunfish (*Lepomis gibbosus*) | 498 |
| 34 | Bluegill X Pumpkinseed (HYBRID) | 2 |
| 35 | Green SF X Bluegill (HYBRID) | 18 |
| 36 | Green Sunfish X Pumpkinseed (HYBRID) | 43 |
| 37 | Green Sunfish X Hybrid (HYBRID) | 27 |
| 38 | Hybrid X Sunfish (HYBRID) | 14 |
| 39 | Yellow Perch (*Perca flavescens*) | 1 |
| 40 | Blackside Darter (*Percina maculata*) | 36 |
| 41 | Logperch (*Percina caprodes*) | 1 |
| 42 | Johnny Darter (*Etheostoma nigrum*) | 590 |
| 43 | Greenside Darter (*Etheostoma blennioides*) | 58 |
| 44 | Rainbow Darter (*Etheostoma caeruleum*) | 2 |
| 45 | Fantail Darter (*Etheostoma flabellare*) | 194 |
| 46 | Mottled Sculpin (*Cottus bairdi*) | 62 |
| 47 | Brook Stickleback (*Culaea inconstans*) | 22 |
| | Total Individuals: | 14,432 |

**TABLE 3. FISH COMMUNITIES OF THE RAVENNA ARSENAL**

| SPECIES | STREAMS | BEAVER SWAMPS | LAKES & PONDS | TOTAL |
|---|---|---|---|---|
| Mt. Brook Lamprey | 22 | – | – | 22 |
| Bowfin | – | 2 | – | 2 |
| Gizzard Shad | 2 | – | – | 2 |
| Rainbow Trout | 11 | – | – | 8 |
| Central Mudminnow | 20 | 225 | 14 | 259 |
| Grass Pickerel | 203 | 84 | 11 | 298 |
| Golden Redhorse | 8 | – | – | 11 |
| N. Hog Sucker | 151 | – | – | 151 |
| White Sucker | 690 | 12 | – | 702 |
| Spotted Sucker | 26 | – | – | 26 |
| Carp | 19 | – | – | 19 |
| Golden Shiner | 54 | 190 | 69 | 313 |
| Blacknose Dace | 1,036 | – | – | 1,036 |
| Creek Chub | 2,362 | – | – | 2,362 |
| S. Redbelly Dace | 742 | – | – | 742 |
| Redside Dace | 20 | – | – | 20 |
| Striped Shiner | 190 | – | – | 190 |
| Sand Shiner | 1 | – | – | 1 |
| Silverjaw Minnow | 896 | – | – | 896 |
| Fathead Minnow | 33 | – | 348 | 381 |
| Bluntnose Minnow | 1,010 | – | – | 1,010 |
| Central Stoneroller | 729 | – | – | 729 |
| Hybrid Minnow | 3 | – | – | 3 |
| Channel Catfish | – | – | 7 | 7 |
| Yellow Bullhead | 50 | 9 | 3 | 62 |
| Brown Bullhead | 3 | 10 | 2 | 15 |
| Black Crappie | 19 | – | – | 19 |
| Rock Bass | 38 | – | – | 38 |
| Largemouth Bass | 53 | 75 | 181 | 309 |
| Warmouth Sunfish | 29 | 25 | 37 | 91 |
| Green Sunfish | 910 | 221 | 202 | 1,333 |
| Bluegill | 261 | 310 | 1,236 | 1,807 |
| Pumpkinseed Sunfish | 111 | 92 | 295 | 498 |
| Hybrid Sunfish | 22 | 44 | 38 | 104 |
| Yellow Perch | 1 | – | – | 1 |
| Blackside Darter | 36 | – | – | 36 |
| Log Perch | 1 | – | – | 1 |
| Johnny Darter | 590 | – | – | 590 |
| Greenside Darter | 58 | – | – | 58 |
| Rainbow Darter | 2 | – | – | 2 |
| Fantail Darter | 194 | – | – | 194 |
| Mottled Sculpin | 62 | – | – | 62 |
| Brook Stickleback | 6 | – | 16 | 22 |
| Total Individuals | 10,674 | 1,299 | 2,459 | 14,432 |
| Total Species | 39+ hybrids | 12+ hybrids | 13+ hybrids | 41+ hybrids |

## TABLE 4. FISH CAPTURED IN BEAVER IMPOUNDMENTS ON THE RAVENNA ARSENAL, PORTAGE CO., OHIO.

| Species | Site | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 |
| Bowfin | - | - | - | 1 | 1 | - | - | - | - |
| Central Mudminnow | 20 | 1 | 27 | 8 | 44 | 121 | - | 3 | 1 |
| Grass Pickerel | 44 | 17 | 12 | - | - | - | - | 11 | - |
| White Sucker | - | - | 1 | - | - | - | 8 | 3 | - |
| Golden Shiner | 102 | 60 | 2 | - | 16 | - | - | 4 | 6 |
| Yellow Bullhead | - | - | 2 | 3 | 4 | - | - | - | - |
| Brown Bullhead | 6 | - | 3 | - | - | - | - | 1 | |
| Largemouth Bass | - | 7 | 5 | 8 | 10 | - | 26 | 2 | 17 |
| Warmouth Sunfish | - | 6 | 17 | 2 | - | - | - | - | - |
| Green Sunfish | - | 4 | 36 | - | - | 108 | - | 16 | 57 |
| Bluegill | 16 | 26 | 38 | 42 | 33 | - | 141 | 14 | - |
| Pumpkinseed Sunfish | 13 | 17 | 5 | 20 | 10 | - | - | 18 | 9 |
| Hybrid Sunfish | - | 5 | 1 | - | 2 | 1 | - | 16 | 19 |
| Total Species | 6 | 8 | 11 | 7 | 7 | 2 | 3 | 9 | 5 |

## TABLE 5. FISH CAPTURED IN MAN-MADE PONDS ON THE RAVENNA ARSENAL, PORTAGE CO., OHIO

| Species | Site | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 |
| Central Mudminnow | - | - | - | 1 | 1 | - | 12 | - | - | - | - | - | - | - | - |
| Grass Pickerel | 1 | - | - | 1 | 1 | - | - | - | - | - | - | - | - | 8 | - |
| Golden Shiner | - | - | 7 | - | - | - | - | - | - | - | - | - | 62 | - | - |
| Fathead Minnow | - | 348 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Channel Catfish. | - | 6 | - | - | - | 1 | - | - | - | - | - | - | - | - | - |
| Yellow Bullhead | - | - | 3 | - | - | - | - | - | - | - | - | - | - | - | - |
| Grown Bullhead | - | - | - | - | - | - | - | - | - | - | - | - | 2 | - | - |
| Largemouth Bass | 7 | - | 21 | 8 | 5 | 16 | - | - | 4 | 12 | 12 | 14 | - | 69 | 13 |
| Warmouth Sunfish | 5 | - | 32 | - | - | - | - | - | - | - | - | - | - | - | - |
| Green Sunfish | 2 | - | 2 | - | 6 | - | 3 | 49 | - | - | 1 | - | 64 | 75 | - |
| Bluegill | 135 | - | 273 | 180 | 27 | 107 | - | - | 16 | 25 | 82 | 191 | - | - | 200 |
| Pumpkinseed Sunfish | 14 | - | 8 | 1 | - | 3 | - | - | - | 1 | 6 | 9 | 4 | 245 | 4 |
| Hybrid Sunfish | 1 | - | - | - | - | - | - | - | - | - | - | - | 10 | 27 | - |
| Brook Stickleback | - | - | - | - | - | - | 16 | - | - | - | - | - | - | - | - |
| Total Species | 6 | 2 | 7 | 5 | 5 | 4 | 3 | 1 | 2 | 3 | 3 | 3 | 4 | 4 | 3 |

**TABLE 6. TOTAL SPECIES BY STREAM SYSTEM IN THE RAVENNA ARSENAL.**

| SPECIES | S. FK. EAGLE CR. | SAND CREEK | HINCKLEY CREEK | OTHER TRIB. | TOTAL |
|---|---|---|---|---|---|
| Mt. Brook Lamprey | 16 | 6 | – | – | 22 |
| Gizzard Shad | 1 | – | 1 | – | 2 |
| Rainbow Trout | 11 | – | – | – | 11 |
| Central Mudminnow | 6 | 6 | 1 | 7 | 20 |
| Grass Pickerel | 64 | 9 | 83 | 47 | 203 |
| Golden Redhorse | 5 | 3 | – | – | 8 |
| N. Hog Sucker | 56 | 94 | 1 | – | 151 |
| White Sucker | 351 | 254 | 77 | 8 | 690 |
| Spotted Sucker | 16 | 10 | – | – | 26 |
| Carp | 19 | – | – | – | 19 |
| Golden Shiner | 17 | 6 | 31 | – | 54 |
| Blacknose Dace | 409 | 582 | 25 | 20 | 1,036 |
| Creek Chub | 400 | 1,335 | 207 | 420 | 2,362 |
| S. Redbelly Dace | 33 | 259 | – | 450 | 742 |
| Redside Dace | 20 | – | – | – | 20 |
| Striped Shiner | 15 | 159 | 16 | – | 190 |
| Sand Shiner | – | 1 | – | – | 1 |
| Silverjaw Minnow | 102 | 677 | 117 | – | 896 |
| Fathead Minnow | 33 | – | – | – | 33 |
| Bluntnose Minnow | 192 | 678 | 140 | – | 1,010 |
| Central Stoneroller | 352 | 332 | 45 | – | 729 |
| Hybrid X Minnow | – | 1 | – | 2 | 3 |
| Yellow Bullhead | 32 | 15 | – | 3 | 50 |
| Brown Bullhead | – | 2 | – | 1 | 3 |
| Black Crappie | 7 | 12 | – | – | 19 |
| Rock Bass | 13 | 9 | 16 | – | 38 |
| Largemouth Bass | 21 | 31 | 1 | – | 53 |
| Warmouth Sunfish | 4 | 9 | – | 16 | 29 |
| Green Sunfish | 198 | 651 | 37 | 24 | 910 |
| Bluegill | 164 | 75 | 5 | 17 | 261 |
| Pumpkinseed Sunfish | 35 | 4 | 8 | 64 | 111 |
| Hybrid Sunfish | 9 | 2 | 11 | – | 22 |
| Yellow Perch | – | – | – | 1 | 1 |
| Blackside Darter | 6 | 28 | 2 | – | 36 |
| Logperch | – | 1 | – | – | 1 |
| Johnny Darter | 125 | 357 | 108 | – | 590 |
| Greenside Darter | 10 | 45 | 2 | – | 58 |
| Rainbow Darter | 2 | – | – | – | 2 |
| Fantail Darter | 33 | 117 | 44 | – | 194 |
| Mottled Sculpin | 18 | – | 44 | – | 62 |
| Brook Stickleback | 6 | – | – | – | 6 |
| Total Individuals | 2,801 | 5,771 | 1,022 | 1,080 | 10,674 |
| Total Species | 35+ hybrids | 30+hybrids | 23+ hybrids | 13+ hybrids | 39+ hybrids |

**TABLE 7. THE STRUCTURE OF THE FISH COMMUNITY IN THE STREAMS OF THE RAVENNA ARSENAL.**

| Rank by No. | Species | No. | Cumulative % by No. | % of fauna by No. |
|---|---|---|---|---|
| 1 | Creek Chub | 2362 | 22.13 | 22.13 |
| 2 | Blacknose Dace | 1036 | 31.83 | 9.70 |
| 3 | Bluntnose Minnow | 1010 | 41.29 | 9.46 |
| 4 | Green Sunfish | 910 | 49.81 | 9.52 |
| 5 | Silverjaw Minnow | 896 | 58.20 | 8.39 |
| 6 | S. Redbelly Dace | 742 | 65.15 | 6.95 |
| 7 | Central Stoneroller | 729 | 71.98 | 6.83 |
| 8 | White Sucker | 690 | 78.44 | 6.46 |
| 9 | Johnny Darter | 590 | 83.97 | 5.53 |
| 10 | Bluegill | 261 | 86.41 | 2.44 |
| 11 | Grass Pickerel | 203 | 88.31 | 1.90 |
| 12 | Fantail Darter | 194 | 90.13 | 1.82 |
| 13 | Striped Shiner | 190 | 91.91 | 1.78 |
| 14 | N. Hog Sucker | 151 | 93.33 | 1.42 |
| 15 | Pumpkinseed Sunfish | 111 | 94.37 | 1.04 |
| 16 | Mottled Sculpin | 62 | 94.95 | 0.58 |
| 17 | Greenside Darter | 58 | 95.49 | 0.54 |
| 18 | Golden Shiner | 54 | 96.00 | 0.51 |
| 19 | Largemouth Bass | 53 | 96.50 | 0.50 |
| 20 | Yellow Bullhead | 50 | 96.97 | 0.47 |
| 21 | Rock Bass | 38 | 97.33 | 0.36 |
| 22 | Blackside Darter | 36 | 97.67 | 0.34 |
| 23 | Fathead Minnow | 33 | 97.98 | 0.31 |
| 24 | Warmouth Sunfish | 29 | 98.25 | 0.27 |
| 25 | Spotted Sucker | 26 | 98.49 | 0.24 |
| 26 | Mt. Brook Lamprey | 22 | 98.70 | 0.21 |
| 27 | Hybrid Sunfish | 22 | 98.91 | 0.21 |
| 28 | Central Madminnow | 20 | 99.10 | 0.19 |
| 29 | Redside Dace | 20 | 99.29 | 0.19 |
| 30 | Carp | 19 | 99.47 | 0.18 |
| 31 | Black Crappie | 19 | 99.65 | 0.18 |
| 32 | Rainbow Trout | 11 | 99.75 | 0.10 |
| 33 | Golden Redhorse | 8 | 99.83 | 0.08 |
| 34 | Brook Stickleback | 6 | 99.89 | 0.06 |
| 35 | Hybrid Minnow | 3 | 99.92 | 0.03 |
| 36 | Brown Bullhead | 3 | 99.95 | 0.03 |
| 37 | Gizzard Shad | 2 | 99.97 | 0.02 |
| 38 | Rainbow Darter | 2 | 99.99 | 0.02 |
| 39 | Sand Shiner | 1 | 100.00 | 0.01 |
| 40 | Yellow Perch | 1 | 100.01 | 0.01 |
| 41 | Logperch | 1 | 100.02 | 0.01 |
| | | 10,674 | | |

Mountain Brook Lamprey, *Ichythomyzon greeleyi*
One of the small non-parasitic lampreys inhabiting small to medium sized streams in Ohio. Populations of this Ohio endangered species were reported by Trautman (1957) for the West Branch Mahoning River and the South Fork of Eagle Creek. There are no recent records for the West Branch Mahoning River but the species is believed to still occur here. A larger previously unknown population of this species was discovered in the Kokosing River in 1987 by this author and Dr. George Phinney of Otterbein College.

Bowfin, *Amia calva*
This is one of the moreprimative species of fish found in Ohio. An inhabitant of weedy bays, marshes, and other habitats characterized by clear waters and submersed aquatic plants, this species was most commonly found in suitable habitats associated with the western basin of Lake Erie. Disjunct populations have also been identified within the Ohio drainage basin in the last 20 years. Populations of this species have declined in Ohio as result of habitat destruction and persecution by fishermen. The capture of this species in wetlands upstream of Big Cobb's Pond off Load Line #3 Road was unexpected. There are no other records at this time for this species in the Mahoning drainage.

Gizzard Shad, *Dorosoma cepedianum*
This is one of the most common forage fish in Lake Erie, the Ohio River and other large streams within the state. This species feeds on phytoplankton and algae. Large schools of young of the year gizzard shad can be obsereved feeding around launch ramps in the fall of the year. While the adults are primarily inhabitants of larger water bodies they will migrate upstream into the smaller tributaries in the spring to spawn. The two fish captured in this study lekely represent wandering individuals from populations further downstream.

Rainbow Trout, *Onchorhynchus mykiss*
A native of the western states, this species has been periodically stocked in various Ohio streams since 1884 by the state and private individuals. The absence of suitable habitat conditions necessary for successful spawning have always relegated this species to "put and take fishery". The presence of small numbers of rainbow trout in the South Fork of Eagle Creek downstream of the old scout lake appears to be the result of past releases of this species in the lake.

Central Mudminnow, *Umbra limi*
This small fish is foundin the glaciated regions of Ohio in those habitats which are characterized by clear waters, beds of submeresed aquatic macrophytes, and clean, silt free bottoms composed of peat and other organic debris. The species is most commonly found in northeaster Ohio at the present time due to the more extensive wetlands and beaver floodings in this quarter of the state. Many populations have been extirpated in Ohio as a result of habitat destruction. On the Ravenna Arsenal this species is

widespread and common in the appropriate habitas. The many beaver impoundments all support populations of this species. This was one of the dominate species at the beaver flooding on Wilcox-Wayland Road (Sation #39).

Grass Pickerel, *Esox americanus vermicula*
This species occurs statewide and is most frequently encountered in the small and medium-sized streams, glacial lakes and wetlands. In stream situations this species is almost always found in association with water willow (Justica americana) or some othere submeresed aquatic providing concealment and ambush cover. This species is foundin lakes and wetlands which are charcterized by lear water and beds of submeresed aquatics. This species was widespread andcommon throughout the arsenal in the many streams, wetlands and ponds.

Golden Redhorse, *Moxostoma erythrurum*
This is the most common of the 6 species of redhorse suckers found in Ohio. They are usually found inlarger rivers and streams of the state but, as with others of their genus, will often migrate into the smaller tributary streams to spawn in the spring. Redhorse feed on a variety of crustaceans and aquatic larvae and spend much of their time in mixed schools cruising the pool
substrates in search of these macroinvertebrates. Only 8 individuals were captures during this survey making it the rarest of the 4 sucker species found on the arsenal. The scarcity of gracel and cobble substrates coupled with the size of the streams may serve to limit this species within the aresenal. The populationin the arsenal would also be affected by the overall size and health of the population further downstream in Eagle Creek.

Northern Hog Sucker, *Hypentelium nigricans*
Unlike the majority of other species of suckers which are pool oriented, the hog sucker is adopted for life in fast currents and is found in the riffles, chutes, and runs of the larger and medium-sized streams throughout Ohio. Both Sand Creek and South Fork Eagle Creek support good populations of this species within the arsenal. Thisspecies is also a good water quality indicator as it requires clean substrates and is sensitive to low levels of dissolved oxygen.

White Sucker, *Catostomus commersoni*
This is one of the commonest and widespread of the suckers in Ohio. It occurs statewide inhabiting a variety of streams, natural lakes, and other water bodies. While the larger adults are more typically found in the larger and medium-sized streams throughout Ohio. This species is more tolerant of increased water turbidities and sation than are the redhorse or hog suckers. This is one of the more common species in the streams on the Ravenna Arsenal ranking 8th overall (690 indivd.) and comprising 6.5% of total individuals captured during the study.

Spotted Sucker, Minytrema melanops
This species is locally distributed around Ohio where it is most often found in

those sections of medium to large streams charcterized by base gradients with clean silt free substrates. The extensive wetlands, harbors, and estuaries associated with western Lake Erie and its tributaries also provided suitable habitat for this species. Spotted sucker populations have declined throughout Ohio as a result of habitast destruction. In the majority of collections made today it is usually represented by only a few individuals when present at all. A samll population of this species was found in the lower regions of South Fork Eagle Creek and Sand Creek within the arsenal boundaries.

Common Carp, *Cyprinus carpio*
This species is native to Eastern Europe and after much effort were successfully introduced into Ohio waters before the turn of the century much to the detriment of every other species of fish in the state. Carp and quality aquatic habitats as we know them are incompatible with each other. This species is a bottom feeder utilizing a variety of organic and animal debris for food. Its constant rooting actions destroy aquatic vegetation, increases and maintain water turbidities, and destroys the eggs of other species. Carp prefer areas of base gradients and are typically not found in the areas of faster gradients. Large adults in streams are often found around woody debris along pool edges where silt deposits are thickest. This is probably the most tolerant species in the state surviving in areas where no other species can. Thankfully, this is a relatively rare species at the Ravenna Arsenal. Only 19 individuals were captured in the lower sections of the South Fork of Eagle Creek despite an abundance of what could be suitable habitat.

Golden Shiner, *Notemigonus crysoleucas*
This species is primarily found in lakes, ponds, oxbows, stream sections of base gradients and other habitats charcterized by relatively clear waters, clean substrates of sand and organic debris, and bedsof submersed aquatic macrophytes. This is one of the larger shiner species in the state reaching lengths of 10 inches in the larger adults. It is often used as a bait minnow by fishermen. The species is found statewide in appropriate habitats and can be rather common in these sites. At the Ravenna Arsenal, this was one of the common and characteristic species of the beaver impoundments. Criggy's Pond and the large wetland north of Criggy's on the North Perimeter Road both supported large populations of this species. Golden shiners were also found in smaller numbers in the streams and ponds on the arsenal. One of the old fish hatchery farms also had a large population of golden shiners, while an adjacent pond which also appeared perfectly suitable for this species had not one.

Blacknose Dace, *Rhinichthys atratulus*
This species is characteristic of small streams and brooks in Ohio having moderate ot high gradients, clear waters, and clean substrates composed of sand, gravel and cobble. While predominantly

a pool dwelling species, riffles with gravel substrates are necessary for spawning. While still a common species in appropriate habitats, many populations have declined or disappeared over the last 30 years as a result of habitat destruction (Trautman 1981). At the Ravenna Arsenal this was the second most abundant stream fish collected (1036 individ.) coming in just ahead of the bluntnose minnow (1010 individ.). It was widespread and abundant in all the tributaries sampled. The excellent forest cover, lack of runoff, pollution, and low siltation rates currently existing at the arsenal combine to produce excellent habitat conditions for this species.

Creek Chub, *Semotilus atromaculatus*
This is one of the most common and widespread stream fish in Ohio. Moderatley tolerant of turbid waters and other types of pollution it is found in a wide range of streams, lakes and ponds. It is most common in the smaller streams and brooks of the state and is one of the characterisic species in these headwater systems. They are often used as bait by fishermen particularly for catfish and pike. This was the most abundant species in the fish community on the Ravenna Arsenal. The total of 2362 individuals counted during these surveys represented over 22% of all fish collected and was twice as many as the second most abundant species (blacknose dace, 1036 individ.). While they were found in every tributary sampled, this species was particularly common is Sand Creek and its tributaries.

Southern Redbelly Dace, *Phoxinus erythrogaster*
A common associate of the blacknose dace, the redbelly dace ismost commonly found in small headwater tributaries having clear waters, well developed pools , and clean substrates composed of sand, gravel and cobbles. This species is more intolerant of turbid waters than the blacknose dace and streams supporting the redbelly dace are generally charcterized by forested riparian zones which filter runoff into these streams. These adjacent forests also act to shade the stream thereby reducing water temperatures in the heat of the summer. This species is most common in the southern and eastern half of Ohio, although many populations ahve been eliminated by habitat destruction. This is particularly true in areas impacted by strip mining and in urbanized areas of the state. While not as common as the blacknose dace in this survey, this was one of the common and characteristic species of the smaller streams found within the Ravenna Arsenal. It was the 6th most abundant species in the community profile (742 individ.). The various small tributaries of San Creek Provided some of the best habitat for this species on the arsenal, however, one small intermittent tributary of the West Branch Mahoning River supported an exceptionally large number of individuals (450) before it dried up in the summer.

Redside Dace, *Clinostomus elongatus*

An associate of the redbelly and blacknose daces, the redside dace is only found in those small streams and brooks having the highest water qualities. These streams are characterized by clear waters, silt free substrates composed of sands, gravels, and coblles, moderate currents, forested riparian zones, and pools of varying depths. In Ohio this species is most frequently found in the small higher gradient headwater streams in northeastern and eastern Ohio. Disjunct populations are found in west central and south central Ohio. This species is more intolerant than the redbelly and blacknose daces to degredation of its habitats and many populations have been eliminated in Ohio. During these surveys a small population of redside dace was identified in South Fork of Eagle Creek in that section of the stream downstream from the old scout lake. For about a mile or so below this lake the stream is characterized by rocky silt free substrates, well developed pools with undercut banks, root wads and other woody debris, and clear waters shaded by the extensive riparian forests found in this area. This species drops out further downstream where where the rocky substrates are replaced largely by sands and finer gravels and the gradients slow. In spite of suitable looking habitats in the Wadsworth Glen upstream from the old scout lake, this species could not be found here.

Striped Shiner, *Luxilus chrysocephalus*
This is one of the common and widespread species of shiners found inOhio. It is statewide in its distribution inhabiting streams of all sizes. A pool dwelling species, the largest populations are often found in the smaller streams in Ohio, particularly during the spring spawning period. The adults tend to drop downstream into the larger pools as the summer progresses. At Ravenna, this species is found in the South Fork of Eagle Creek upstream as far as the dam at Paris Windham Road, throughout the mainstem of Sand Creek, and at two of the sites on Hinckley Creek. The 190 individuals captured ranked this species 13th in the community structure for the arsenal.

Sand Shiner, Notropis stamineus
This species can be found statewide in the larger streams ahving moderate gradients. It is most frequently found over sand and gravel substrates in riffles, runs, and pools having enough current to keep the substrates silt free. The single individual captured in Sand Creek during this study would appear to represent a stray from populations further downstream. The lower sections of both South Fork Eagle Creek and Sand Creek provided suitable habitats for this species. The absence of this species could probably be attributed to the smaller nature of these streams and the slower gradients. The Ohio EPA did not findthis species in their surveys on Eagle Creek and its South Fork in 1981 and 1987.

Silverjaw Minnow, *Notropis buccatus*
This small minnow is found statewide in small to medium-sized streams. The largest populations are found in the smaller streams characterized by moderate gradients, good pool development, and clean substrates

composed of sands and fine gravel. This speciesis more tolerant of pollution and increased water turbidities than many other species. This was one of the common and characteristic species in the streams of the Ravenna Arsenal. Populations were found throughout the mainstream of Sand Creek, in the South Fork of Eagle Creek upstream to the dam at Paris-Windham Road, and at two locations in Hinckley Creek. It ranked 5th in abundance overall and comprised 8.4% of all individuals collected.

Fathead Minnow, *Pimephales promelas*
Thisis one of the more tolerant species of fish found in the state. It can survive under conditions of pollution, increased water turbidities, even low pH's that are usually not conducive to most of the other species. Fathead populations tend to flourish only in the absence of competition from other species it normally associates with like the bluntnose minnow. This species is normally found in small streams, ponds and lakes. It is frequently raised and sold as bait minnow for fishermen and many populations may be the result of "bait bucket introductions". This species was found in small numbers in the lower sections of South Fork Eagle Creek in the Ravenna Arsenal. Kelly's Pond, a small turbid pond formally used as a disposal area at one time, supported a large population of fathead minnows. The only other species present in this pond were a small number of channel catfish released by the local conservation club. It would appear that Kelly's Pond was being used as a rearing pond for fathead minnows.

Bluntnose Minnow, *Pimephales notatus*
This is probably the most common fish in Ohio. Bluntnose utilize and tolerate a wide variety of habitat conditions. They are foundin every waterbody capable of supporting fishlife and thrive in turbid, nutrient rich waters. They are equally at home in small streams and brooks as they are in the largest rivers and lakes. At the Ravenna Arsenal this species ranked 3rd in abundance just behind the blacknose dace. It was largely absent from the smaller, more intermittent tributaries but was present at most of themainstream collecting sites on South Fork Eagle Creek, Sand Creek, and Hinckley Creek. It was absent in collcetions made in the beaver impoundments and artificial waterbodies.

Central Stoneroller; *Compostoma anomalum*
This species iscommon and abundant in streams throughout much of Ohio. It is found primarily in the riffles and runs of the smaller to medium-sized streams but also accurs in the larger rivers of the state. Stonerollers are bottom feeders utilizing a variety of plant and animal matter. At Ravenna, stonerollers were common throughout the mainstems of the three major tributaries, mimicking the distribution of the bluntnose minnow. They were absent from the smaller, intermittent tributaries and other waterbodies. Stonerollers ranked 7th in the overall community structure accounting for 6.8% of all the individuals counted in the survey.

Channel Catfish, *Ictalurus punctatus*
This species is found statewide in larger rivers and lakes. Although it is primarily an inhabitant of the larger and deeper waterbodies, it will often migrate into the smaller tributaries in the spring to spawn. At Ravenna this species was recorded from only two of the pnds (Kelly's and S. Service Road) where it had been stocked by conservation club members. It is possible that this species was stocked in other ponds as well.

Yellow Bullhead, *Ameiurus natalis*
This species is most commonly found in the glaciated portions of Ohio in the shallower areas of the larger lakes, ponds, estuaries, and lower gradient streams. It was most common in thosehabitats characterized by clear waters, silt free substrates, and beds of submersed aquatic vegetation. It is one of the characteristic species in the glacial lakes of northern Ohio. In stream situations it is almost always found in the deeper pools hiding in undercut banks or around rootwads and other woody debris. Populations of this species have shown a persistent decline in Ohio since the turn of the century. Much of this decline is blamed on habitat degradation due to excessive siltation and destruction of aquatic vegetation (Trautman 1981). At Ravenna, this species was found in modest numbers in the lower sections of these streams with their numerous pools, base gradients, undercut banks, and woody debris provide perfect habitat for this species.

Brown Bullhead, *Ameiurus nebulosus*
This species is found statewide in small numbers occupying similar habitats as the yellow bullhead. It prefers deep waters compared to other species of bullheads in Ohio. The largest populations were found in western Lake Erie and the larger inland glacial lakes and canal lakes. Increasing water turbidities and the loss of the submersed beds of aquatic vegetation have resulted in a general population decline of this species throughout Ohio. This species was found in small numbers (15 individ.) in the streams and impoundments on the Ravenna Arsenal. The majority of these individuals (10) were captured in the older beaver impoundments weith the large flooding in the northeast corner of the arsenal on the Trumbull County line supporting the largest population.

Black Crappie, *Poxomis nigromaculatus*
This species is found statewide in small numbers. It doesn't compete well with the more common white crappie and is more sensitive to increased water turbidities that the white crappie.
The larger populations were foundin habitats characterized by clear water, silt free substrates,and submersed beds of aquatic macrophytes such as was found in the western basin of Lake Erie. This species has been stocked in every county of the state at one time or another.
Small numbers of this species were collected in the lower reaches of South Fork Eagle Creek and Sasnd Creek during sureveys on the Ravenna Arsenal. The majority of the individuals captured were small juveniles which may have moved into the area from downstream sites. While the streams on the arsenal

provide suitable habitats for this species in the form of clear water, clean substrates, and aquatic vegeatation, they are probably too small to support significant population.

Rock Bass, *Ambloplites rupestris*
This is one of the common stream fishes found in Ohio. It occurs statewide showing a preference for the medium and larger streams having moderate gradients and rocky substrates. Lake Erie also supported a large population at one time. During the Ravenna surveys, small numbers of rock bass were found in Hinckley Creek, Sand Creek, and South Fork Eagle Creek. Surprisingly, no rock bass were captured in the South Fork Eagle Creek in the stretch between Paris-Windham Road and the old scout lale. The rocky substrates and higher gradients in this section would appear to offer the best habitats for this species in the arsenal.

Largemouth Bass, *Micropterus salmoides*
An inhabitant of lakes, estuaries, and slackwater pools of the larger streams throughout Ohio, this species has probably been stocked into every suitable body of water in the state. The largest populations were originally found in those habitats characterized by clear waters, silt free substrates, and beds of submersed aquatic vegetation. This species is common in the lakes and streams on the Ravenna Arsenal. The laregest populations were found in various ponds and lakes on the property with smaller numbers present in the beaver impoundments and stream habitats.

Warmouth Sunfish, *Lepomis gulosus*
The warmouth is one of the characteristic species of the glacial lakes of northern Ohio and other wetlands identified by their clear waters and beds of submersed aquatic vegetation. It may also occur in base gradient streams where these same habitat conditions exist. Current populations in the state are highly disjunct and often small due to the general destruction of this aquatic habitat in Ohio. While this species was introduced into a number of habitats throughout Ohio in the past most of these introductions failed to establish additional populations of the warmout sunfish due to a lack of suitable habitats. The various aquatic habitats at Ravenna Arsenal supported a modest population of this species. It was the least common of the 4 species of sunfish found on the arsenal. It was recorded in about equal numbers between the streams, beaver impoundments, and ponds and lakes on the arsenal. It is likely that it was stocked either inadvertently or intentionally into the various man-made ponds it was recored from. Two of the larger populations of the warmout at Ravenna were found in the beaver impoundemnt adjacent to Sand Creek and Smalley Road in Little Cobb's Pond on Paris-Windham Road.

Green Sunfish, *Lepomis cyanellus*
This is on eof the common fish found throughout Ohio. It is tolerant to a variety of habitat conditions and will thrive under conditions of habitat degradations not suitable for other

members of its genus in Ohio. An inhabitant of pools and other areas ofbase gradients, it is found in streams, lakes, ponds, and wetlands of all sizes statewide. It often Hybridyzes with other species of sunfishes and a large number of green sunfish hybrids were found in habitats throughout the arsenal. At Ravenna, this was the 4th most common species recorded accounting for 9.5% of all individuals counted. It was equally common in all the habitats samples occuring in even the smaller tributaries.

Bluegill Sunfish, *Lepomis macrochirus*
A species of ponds and lakes, this is one of the most common and widespread species in Ohio, thanks primarily to intensive stocking efforts over the last 50 years or so. The larger populations prior to these efforts were found in the glacial and canal lakes of the state and in the shallow estuaries, bays, and harbor areas of western Lake Erie. At Ravenna, this was the 2nd most numerically abundant species collected, second only to the creek chub. While ranking only 10th in the stream community (261 individ.) , it was the most common species collected in the beaver impoundments and man-,ade lakes on the arsenal.

Pumpkinseed Sunfish, *Lepomis gibbosus*
A common associate of the warmouth sunfish, this species is almost always associated with clear waters, silt free substrates and submersed beds of aquatic vegetation. It is one of the characteristic species of northern Ohio glacial lakes and base gradient streams meeting these habitat requirements. The majority of the populations are found in northeren Ohio, but extensive stocking efforts in past years succeeded in establishing populations in other areas of the state. The aquatic habitats of the Ravenna Arsenal supported a fairly good population of this species overall. Surprisingly, more individuals were collected from the streams thenmselves than from the beaver impoundments contrary to what I might have expected (111 vs 92). This species ranked 15th out of 41 in the stream community structure. The largest numbers were found in the various man-made lakes on the Arsenal. It is apparent that this species must have been stocked into most of those lakes in which it was found. The largest population of this species at the arsenal was found in the large hatchery pond off Route 80 where 245 individuals were collected. No other collecting stattion had more than 20 individuals recorded at any one time.

Yellow Perch, *Perca flavescens*
This species was originally restricted to Lake Erie and adjacent tributary mouths. The largest populations were found in the shallow, clear water habitats characterized by silt free substrates and submersed beds of aquatic vegetation. It has been stocked into many of the lakes throughout Ohio and individuals are often found in streams tributary to these impoundments. It is found in some of the larger glacial lakes in northern Ohio, but whether these populations are the result of stocking or represent natural populations is unclear.

Blackside Darter, *Percina maculata*
This pool dwelling species can be found statewide in rivers and streams of moderate gradients having substrates composed primarily of sands and gravels. It is most common in the medium-sized streams. It is often found near the base of riffles or in pools having a modest current where it will frequently be found hiding in undercut banks, rootwards, and other forms of woody debris. Populations are usually not large in any one area when compared to other species of darters. At Ravenna, the lower section of Sand Creek supported the best population of this species. Small numbers were also found in the lower reaches of South Fork Eagle Creek and Hinckley Creek. These streams, while somewhat small overall, provide good habitats for this species with their modest gradients, silt free sand and gravel substrates, clear waters, and pools with undercut banks and abundant woody debris. While less common than the greenside and fantail darters in these streams, the blackside darter still ranked 22nd out of 41 in the community structure for these streams.

Logperch, *Percina caprodes*
This species occurs statewide where it is primarily foundin the larger rivers and streams in riffle and pool habitats characterized by moderate currents and clean substrates composed of sand, gravel, and cobble. It is frequently found in the deeper waters at the base of riffles. Populations have declined throughout Ohio as a result of habitat degradations brought on by increasing water turbidities and siltation of substrate. At Ravenna, a single individual was collected with a seine in a deep pool below a railroad culvert in Sand Creek north of Smalley Road in May. No other individuals were collected in this study, and it seems likely this individual represents a stray or migrant from potential populations further downstream in the Eagle Creek drainage.

Johnny Darter, *Etheostoma nigrum*
This is porbably the most common and widespread of the darters in Ohio. It occurs in streams and rivers of all sizes where it is found in pools and other slack water habitats on sand and gravel substrates. It is not as sensitive as other species of darters to increased water turbidities and will tolerate some siltation of its habitats. At Ravenna, this species was found throughout the mainstems of South Fork Eagle Creek, Sand Creek, and Hinckley Creek. It was largely absent from the smaller, more intermittent tributaries. Of the 6 species of darters recorded in this survey, the numbers of this species exceeded all the others combined. The 590 individuals captured ranked this species 9th in the community structure for these streams.

Greenside Darter, *Etheostoma blennioides*
This is another of the common and widespread darters found statewide in medium and large rivers. While not a pool species, it prefers slower currents and is usually found at the head of riffles or along the edges where the currents are less swift. It is often found in association with growths of filamentous algae, which afford it excellent hiding places. At Ravenna, small numbers of

this species were found in the lower sections of the three primary tributary streams on the property. The overall size of these streams on the arsenal limits the populations of this species here. Even so this species still ranked 17th in the overall community structure for these streams.

Rainbow Darter, *Etheostoma caeruleum*
This species is found statewide in the smaller and medium sized streams. It prefers riffles of moderate gradients composed primarily oof gravel and small cobble. In many streams it can be the dominate darter species on these riffles. At Ravenna, only two individuals of this species were collected dspite what appeared to be suitable habitats throughout sections of the South Fork of Eagle Creek and to a lesser extent Sand Creek. The individuals captured were taken from a riffle in the lower section of SouthFork Eagle Creek. In their surveys on Eagle Creek in 1981 and the South Fork in 1987, the Ohio EPA did not record this species at any of their collectiong sites. The species is more common in tributary streams to Lake Erie just to the north of this drainage system.

Fantail darter, *Etheostoma flabellare*
This species is found statewide in the smaller and medium-sized streams. Preferred habitats are similar to the greenside darter in that it prefers riffles or sections of riffles having slower currents with substrates composed of gravels and smaller cobbles. This species is more tolerant to siltation and other types of pollution than most of the other darters in the state. At Ravenna, populations of this species were found throughout the mainstems of the principal tributary streams. It was generally absent from the smaller, more intermittent tributaries. It was the 2nd most abundant of the 6 darter species found and ranked 12th overall (194 individ.) in the community structure for the stream fish.

Mottled Sculpin, *Cottus bairdi*
This speciesis found in the smaller streams and brooks of Ohio which are characterized by permanent flows, clear, cool waters, moderate to high gradients, and clean substrates of sand, gravel and cobble. They are most frequently taken on riffles but occupy pools where sufficient gradients exist. Populations in Ohio are extremely fragmented and are primarily centered along the glacial boundary, west central Ohio, and around Lake Erie islands. Many populations have declined or disappeared as a result of general habitat degradations including the entire Lake Erie population (Trautman 1981). At Ravenna, small populations were found in Hinckley and in a small stretch of South Fork Eagle Creek above the Wadsworth Glen area. Hinckley Creek supported the best population of this species where they were taken as far upstream as Magazine Road. The 62 individuals captured placed this species 16th overall in the stream community ranking.

Brook Stickleback, *Culaea inconstans*
This northern species of clear, cold waters reaches the southern edge of its range in Ohio where it is primarily found in smaller headwater streams characterized by clear waters and dense

beds of submerged aquatic vegetation. Populations in Ohio are extremely in nature with the primary center of distribution occurring in northeastern Ohio and the Mad River drainage in west central Ohio. The small headwater habitats occupied by this species are easily destroyed by ditching, dredging, and filling, and many populations have been extirpated. At Ravenna, this species was collected at two locations only. A small population was found in a small pool in the very headwaters of South Fork Eagle Creek. This pool, located just below a railroad culvert, was characterized by relative clear water, a soft bottom composed of organic debris, and submersed aquatic vegetation. The pool was small enough that a dipnet was used to sample it. A second, larger population of sticklebacks, was found in a small sringfed artificial pond located just east of Georege Road at the first set of railroad tracks north of the security building. This pond had 2-3 feet of soft, organic matter on the bottom, thick beds of aquatic plants, and much woody debris in it. A total of 16 stickleback were collected with a dipnet but many more were unboubtably present. This is the best population of sticklebacks on the arsenal and every effort should be made to preserve this habitat as it is.