

ALL DEVELOPED LANDS HABITATS NARRATIVE

This habitat narrative is the results of the aggregated data for all developed land sub-habitat types.

Habitat description

Highly impacted lands, intensively modified to support human habitation, transportation, commerce and recreation.

Problems affecting species and habitats

Species threats

Respondents ranked the following threats to wildlife in all developed lands habitats in Indiana:

Rank	Threats to wildlife in all developed lands habitats
1	Degradation of movement/migration routes (overwintering habitats, nesting and staging sites)
2	Diseases/parasites (of the species itself)
3	High sensitivity to pollution
4	Species overpopulation
5	Bioaccumulation of contaminants
6	Genetic pollution (hybridization)
7	Invasive/non-native species
8 (tie)	Dependence on irregular resources (cyclical annual variations) (e.g., food, water, habitat limited due to annual variations in availability)
8 (tie)	Habitat loss (breeding range)
9 (tie)	Predators (native or domesticated)
9 (tie)	Unintentional take/ direct mortality (e.g., vehicle collisions, power line collisions, by-catch, harvesting equipment, land preparation machinery)
9 (tie)	Habitat loss (feeding/foraging areas)
10 (tie)	Dependence on other species (mutualism, pollinators)
10 (tie)	Unregulated collection pressure
11	Viable reproductive population size or availability
12 (tie)	Regulated hunting/fishing pressure (too much)

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- 12 (tie) Specialized reproductive behavior or low reproductive rates
- 13 (tie) Near limits of natural geographic range
- 13 (tie) Large home range requirements
- 14 Small native range (high endemism)

Respondents offered additional threats to wildlife in all developed lands habitats in Indiana (not ranked):

- Genetic pollution due to urbanization and domestication of 'wild' mallards, leading to the hybridization with domestic stock of ducks. This threat constitutes displacement of mallards into undesirable/unnatural areas, creating nuisance problems and genetic integrity concerns
- Canada goose/human conflicts
- Abrupt changes in drainage patterns due to development could affect Kirtland's snakes, which also can be adversely affected by moving, moving or clearing debris
- Tolerance by building managers of nesting sites

Respondents listed top threats to wildlife in all developed lands habitats in Indiana (not ranked):

- Canada geese
 - Overpopulation
 - Aggressive behavior during courtship/nesting
- Migratory habitat loss
- Genetic pollution; population explosions and accompanying diseases; nuisance concerns, etc.
- Urbanization
- Development of drainage areas and flood plains, including development of park-like areas in which natural or man-made cover is removed; habitat fragmentation that disrupts gene flow and recolonization
- Availability of undisturbed nesting sites
- Collisions with buildings, power lines, other structures
- House Sparrow preemption of nests
- Vandalism potential at nesting colonies

Technical experts and conservation organizations reviewed the above results and were asked if these were a reasonable representation of the threats to wildlife in all developed lands habitats. There were no responses.

Habitat threats

Respondents ranked threats to all developed lands habitats in Indiana:

Rank	Threats to all developed land habitats
1	Commercial or residential development (sprawl)
2 (tie)	Habitat degradation
2 (tie)	Stream channelization
3	Residual contamination (persistent toxins)

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- 4 (tie) Counterproductive financial incentives or regulations
- 4 (tie) Impoundment of water/flow regulation
- 5 Point source pollution (continuing)
- 6 Drainage practices (stormwater runoff)
- 7 Agricultural/forestry practices
- 8 Habitat fragmentation
- 9 Nonpoint source pollution (sedimentation and nutrients)
- 10 (tie) Diseases (of plants that create habitat)
- 10 (tie) Invasive/non-native species
- 11 Climate change
- 12 Successional change
- 13 Mining/acidification

Respondents noted additional threats to all developed lands habitats in Indiana (not ranked):

- Developed land creates a threat to quality habitat for mallards. Mallards in an urban setting face a host of problems for humans and mallards (genetic pollution, nuisance ducks, possible fecal contamination, etc.
- The impact of non-native earthworms should be closely monitored, as the Kirtland's snake's natural diet is believed to be predominantly of earthworms and slugs. The ecological impact of non-native invertebrates has not been adequately studied
- Potential for pollution reducing productivity of aquatic habitats over which cliff swallows feed

Respondents listed top threats to all developed lands habitats in Indiana (not ranked):

- Canada geese
- Regulations
- Urban development
- Mallards
 - Urban development creates attractive areas for mallards to become "more domesticated" (i.e., retention/detention ponds)
 - Feeding of birds by people
 - Destruction of beneficial areas for mallards (and other puddle ducks), i.e. wetlands, streams, small ponds, etc. These areas are converted to retention/detention ponds
- Retention ponds
- Development of drainage areas and flood plains, including development of park-like areas in which natural or man-made cover is removed
- Habitat fragmentation that disrupts gene flow and recolonization
- Reduction in quantity and quality of prey populations
- Design of buildings that do not provide nesting ledges
- Changes in design of bridges and causeways to make them less suitable for nest placement

Technical experts and conservation organizations reviewed the above results and were asked if these were a reasonable representation of the threats to all developed lands habitats. There were no responses.

Additional research and survey efforts

Current body of research

Species research

Thirty-seven percent respondents stated that the current body of science is complete, up to date and extensive or adequate for wildlife in all developed lands habitats in Indiana; sixty-three percent said that it is inadequate or nonexistent.

Respondents identified the following citations (title, author, date, publisher) that would give the best overview of wildlife in ALL developed lands habitats in Indiana.

Title = Amphibians and Reptiles of Indiana;
Author = Sherman A. Minton, Jr.;
Date = 2001;
Publisher = Indiana Academy of Sciences

Author = www.natureserve.org/explorer

Title = Managing Canada Geese in Urban Environments;
Author = Arthur E. Smith, Scott R. Craven and Paul D. Curtis;
Date = 1199;
Publisher = Cornell Cooperative Extension

Title = Prevention and Control of Wildlife Damage;
Date = 1994;
Publisher = University of Nebraska

Title = Conservation Assessment for Kirtland's Snake (*Clonophis kirtlandii*);
Author = Jonanna Gibson and Bruce Kingsbury;
Date = 2004;
Publisher = USDA Forest Service, Eastern Region

Title = Kirtland's Snake;
Author = www.natureserve.org

Title = Peregrine Falcon nesting and management in Indiana;
Author = Castrale, J.S., and A. Parker;
Date = 1999;
Publisher = Indiana Audubon Quaterly 77:65-74.

Title = Midwest Peregrine Falcon Restoration - 2004 Annual Report;
Author = Tordoff, H.B., J.A. Goggin, J.S. Castrale;
Date = 2004;
Publisher = The Raptor Center at the Univ. of Minnesota

Technical experts and conservation organizations reviewed the above results and were asked if these were a reasonable representation of the current body of science for all wildlife in all developed lands habitats. There were no responses.

Habitat research

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Twenty-eight percent respondents stated that the current body of science is complete, up to date and extensive or adequate for all developed lands habitats in Indiana; fifty-seven percent said that it is inadequate or nonexistent.

Respondents identified the following citations (title, author, date, publisher) that would give the best overview of ALL developed lands habitats in Indiana.

Title = Managing Canada Geese in Urban Environments;
Author = Arthur E. Smith, Scott R. Craven and Paul D. Curtis;
Date = 1999;
Publisher = Cornell Cooperative Extension

Title = Amphibians and Reptiles of Indiana;
Author = Sherman A. Minton, Jr.;
Date = 2001;
Publisher = Indiana Academy of Science

Title = Indiana Heritage Database;
Author = Indiana Division of Nature Preserves

Technical experts and conservation organizations reviewed the above results and were asked if these were a reasonable representation of the current body of science for all developed lands habitats. There were no responses.

Research needs

Species research

Respondents ranked research needs for wildlife in all developed lands habitats in Indiana:

Rank	Research needs for wildlife
1	Distribution and abundance
2	Limiting factors (food, shelter, water, breeding sites)
3	Relationship/dependence on specific habitats
4	Population health (genetic and physical)
5	Threats (predators/competition, contamination)
6	Life cycle

Respondents noted other research needs for wildlife in all developed lands habitats in Indiana (not ranked):

- Canada geese
 - Movement pattern of urban Canada geese
 - Affinity for Canada geese hatched in an urban environment to move or migrate back to a similar environment
- Ways to reduce urban populations
- Mallards
 - To determine the genetic integrity of mallards in developed areas

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- To determine effective management tools and a management plan of mallards in developed lands

Technical experts and conservation organizations reviewed the above results and were asked if these were a reasonable representation of the research needs for wildlife in all developed lands habitats. There were no responses.

Habitat research

Respondents ranked research needs for all developed lands habitats in Indiana:

Rank	Research needs for all developed lands habitat
1	Relationship/dependence on specific site conditions
2	Distribution and abundance (fragmentation)
3	Threats (land use change/competition, contamination/global warming)
4	Growth and development of individual components of the habitat
5	Successional changes

Respondents noted additional research needs for all developed lands habitats in Indiana (not ranked):

- Ways to exclude geese
- Mallards
 - To determine the long term effects of mallards in developed lands on the overall mallard population
 - To device management tools and concepts to help professionals manage better for mallards in developed lands
- Understand why Kirtland's snakes occur where we are currently finding them. With that information, we can maintain current populations before we determine the feasibility of increasing their numbers and distribution

Technical experts and conservation organizations reviewed the above results and were asked if these were a reasonable representation of the research needs for all developed lands habitats. There were no responses.

Conservation actions necessary

Species actions

Respondents ranked conservation efforts by how well they address threats to wildlife in all developed lands habitats in Indiana:

Rank	Conservation efforts for wildlife in all developed lands
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- 1 Protection of migration routes
- 2 Regulation of collecting
- 3 (tie) Population management (hunting, trapping)
- 3 (tie) Food plots
- 3 (tie) Habitat protection
- 4 Public education to reduce human disturbance
- 5 Limiting contact with pollutants/contaminants
- 6 (tie) Population enhancement (captive breeding and release)
- 6 (tie) Reintroduction (restoration)
- 6 (tie) Threats reduction
- 6 (tie) Native predator control
- 6 (tie) Exotic/invasive species control
- 6 (tie) Disease/parasite management
- 6 (tie) Translocation to new geographic range
- 6 (tie) Culling/selective removal
- 6 (tie) Stocking

Respondents noted additional conservation efforts for wildlife in all developed lands habitats in Indiana (not ranked):

- Bullfrog tadpoles could be introduced into an area as by-product to fish stocking or from released pet tadpoles
- Habitat alteration

Respondents recommended these practices for more effective conservation of wildlife in all developed lands habitats in Indiana (not ranked):

- I believe large numbers of Canada Geese in urban environments (developed lands) are a real problem. This also is the belief of many Fort Wayne residents. Urban goose-human conflicts are on the rise. Each year the Division of Fish and Wildlife issues more and more egg/nest destruction and trap/transport permits. Urban areas attract geese by offering lakes and ponds, short lush lawns, protection and even those individuals who intentionally feed geese. Effective conservation for urban geese should deal with how to limit numbers through education and habitat modifications. (I.e.: If a retention pond must be constructed, install habitats around the pond that help limit geese. Urban geese can nest in inappropriate sites, demonstrate aggressive behavior, cause damage to lawns, beaches, sidewalks, parking lots, etc.) The best conservation practice is to limit Canada goose numbers in developed land habitats
- Population reduction
- Hunting; habitat alteration
- Removal of habitat in urban zones
- When areas known or suspected to have Kirtland's snakes are threatened with development, seek to have the developer include shrubs and rock features near drainages to provide cover and to reduce mowing in areas Kirtland's snakes are likely to use

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- Education/awareness of falcon needs for feeding and nesting
- Continued use of bridge architecture that favors nest placement

Technical experts and conservation organizations reviewed the above results and were asked if these were a reasonable representation of the conservation of wildlife in all developed lands habitats. There were no responses.

Habitat actions

Respondents ranked conservation efforts by how well they address threats to all developed lands habitats in Indiana:

Rank	Conservation efforts for all developed lands habitat
1 (tie)	Habitat protection incentives (financial)
1 (tie)	Habitat restoration incentives (financial)
1 (tie)	Artificial habitat creation (artificial reefs, nesting platforms)
1 (tie)	Succession control (fire, mowing)
1 (tie)	Land use planning
2	Habitat restoration on public lands
3 (tie)	Corridor development/protection
3 (tie)	Habitat protection on public lands
3 (tie)	Cooperative land management agreements (conservation easements)
3 (tie)	Habitat restoration through regulation
4 (tie)	Managing water regimes
4 (tie)	Protection of adjacent buffer zone
5 (tie)	Restrict public access and disturbance
5 (tie)	Technical assistance
5 (tie)	Habitat protection through regulation
6	Pollution reduction
7	Selective use of functionally equivalent exotic species in place of extirpated natives

Respondents listed additional conservation efforts for all developed lands habitats in Indiana:

- The development and proliferation of stormwater retention ponds

Respondents recommended the following practices for more effective conservation of all developed lands habitats in Indiana (not ranked):

- I believe large numbers of Canada Geese in urban environments (developed lands) are a real problem. This also is the belief of many Fort Wayne residents. Urban goose-human conflicts are on the rise. Each year the Division of Fish and Wildlife

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issues more and more egg/nest destruction and trap/transport permits. Urban areas attract geese by offering lakes and ponds, short lush lawns, protection and even those individuals who intentionally feed geese. Effective conservation for urban geese should deal with how to limit numbers through education and habitat modifications. (I.e.: If a retention pond must be constructed, install habitats around the pond that help limit geese. Urban geese can nest in inappropriate sites, demonstrate aggressive behavior, cause damage to lawns, beaches, sidewalks, parking lots, etc.) The best conservation practice is to limit Canada goose numbers in developed land habitats

- Landscaping to exclude geese
- Habitat alteration
- Removal of habitat in urban zones
- When areas known or suspected to have Kirtland's snakes are threatened with development, seek to have the developer include shrubs and rock features near drainages to provide cover and to reduce mowing in areas Kirtland's snakes are likely to use
- Education/awareness programs for building managers.
- Critical habitat for cliff swallows is nesting sites; most are on public (DOT) structures (bridges). Much less important is water quality, etc. for feeding areas

Technical experts and conservation organizations reviewed the above results and were asked if these were a reasonable representation of the conservation practices for all developed lands habitats. There were no responses.

Partner agencies/organizations

The following organizations indicated that they work in Developed lands habitats.

Organization	Percent of time spent in Developed lands habitats
Midwest Peregrine Falcon Recovery Project	70
Indiana Department of Natural Resources Division of Forestry, Properties Section (State Forests)	60
American Consulting, Inc.	45
Cordry Sweetwater Conservancy District	45
JFNew and Associates	40
Hoosier Heartland Resource Conservation and Education council	35
Cinergy Corp.	30
MWH Americas, Inc.	30
Lake Lemon Conservancy District	25
Lake Maxinkuckee Environmental Council (LMEC)	25
Northwestern Indiana Regional Planning Commission (NIRPC)	25
Veolia Water Indianapolis, LLC	25
Wabash River Heritage Corridor Commission	25
Earth Source, Inc.	20
EnviroScience Incorporated	20
Indiana Association of Soil and Water Conservation Districts	20

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Indiana Chamber of Commerce	20
Steelheaders of Northwest Indiana (Northwest Indiana Steelheaders)	20
Summit Lake State Park	20
Sierra Club Hoosier Chapter	15
St. Joseph County Soil & Water Conservation District (SWCD)	15
US Fish and Wildlife Service Ecological Services (does not include national wildlife refuges)	15
Arrow Head Country Resource Conservation & Development Area, Inc.	10
Indiana Association of Cities and Towns	10
Indiana Native Plant and Wildflower Society	10
Indiana Quail Unlimited	10
Naval Support Activity Crane	10
Valparaiso Lakes Area Conservancy District	10
Valparasio Chain of Lakes Watershed Group, Inc.	10
St. Joseph River Watershed Initiative	7
Muscatatuck National Wildlife Refuge US FWS	6
Blue Heron Ministries, Inc.	5
IN DNR, Division of State Parks & Reservoirs, Interpretive Services	5
Indiana Environmental Institute	5
Indiana state trappers assoc	5
Indianapolis Power & Light Co.	5
Lost River Conservation Association	5
Northeastern Indiana Trout Association	5
Robert Cooper Audubon Society	5
U.S. Department of Agriculture, Forest Service Hoosier National Forest	5
Division of Fish and Wildlife	2.5
Indiana Division of the Izaak Walton League of America	2
American Society of Landscape Architects, Indiana Chapter	
Federal Highway Administration (FHWA)	
Fur Takers of America	
fur takers of america chapter 7-E north west in.	
Great Lakes Commission	
Indiana Land Resources Council	
Law Enforcement Division, Indiana Department of Natural Resources	

Proposed plans for monitoring

Current monitoring

Species monitoring

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Respondents were aware of the following monitoring efforts by state agencies for wildlife in all developed lands habitats in Indiana (not ranked):

- Statewide year-round monitoring
- Statewide once-a-year monitoring
- Periodic statewide (less than once a year but still regularly scheduled) monitoring
- Occasional statewide (less than once a year and not regularly scheduled) monitoring
- Regional or local year-round monitoring
- Regional or local once-a-year monitoring
- Periodic regional or local (less than once a year but still regularly scheduled) monitoring
- Occasional regional or local (less than once a year and not regularly scheduled) monitoring

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Respondents were aware of the following monitoring efforts by other organizations for wildlife in all developed lands habitats in Indiana (not ranked):

- Statewide year-round monitoring
- Statewide once-a-year monitoring
- Periodic statewide (less than once a year but still regularly scheduled) monitoring
- Occasional statewide (less than once a year and not regularly scheduled) monitoring
- Regional or local year-round monitoring
- Regional or local once-a-year monitoring
- Periodic regional or local (less than once a year but still regularly scheduled) monitoring
- Occasional regional or local (less than once a year and not regularly scheduled) monitoring

Respondents ranked monitoring efforts by state agencies based on their importance for conservation of wildlife in all developed lands habitats in Indiana:

Rank	Monitoring efforts by state agencies for conservation of wildlife in all developed lands
1	Statewide once-a-year monitoring
2	Periodic regional or local (less than once a year but still regularly scheduled) monitoring
3	Statewide year-round monitoring
4 (tie)	Periodic statewide (less than once a year but still regularly scheduled) monitoring
4 (tie)	Occasional regional or local (less than once a year and not regularly scheduled) monitoring
5	Regional or local once-a-year monitoring
6	Regional or local year-round monitoring
7	Occasional statewide (less than once a year and not regularly scheduled) monitoring

Respondents ranked monitoring efforts by other organizations based on their importance for conservation of wildlife in all developed lands habitats in Indiana:

Rank	Monitoring efforts by other organizations for conservation of wildlife in all developed lands
1	Regional or local year-round monitoring
2 (tie)	Periodic regional or local (less than once a year but still regularly scheduled) monitoring
2 (tie)	Periodic statewide (less than once a year but still regularly scheduled) monitoring
3	Statewide year-round monitoring

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- 4 Regional or local once-a-year monitoring
- 5 (tie) Occasional regional or local (less than once a year and not regularly scheduled) monitoring
- 5 (tie) Occasional statewide (less than once a year and not regularly scheduled) monitoring
- 6 Statewide once-a-year monitoring

Respondents listed regional or local monitoring by state agencies for wildlife in all developed lands habitats in Indiana (not ranked):

- Indiana Division of Fish and Wildlife conducts Canada goose banding yearly. This consists of neck collars and leg bands. Waterfowl surveys are also conducted. Hunter harvests are reported.
- The Wildlife Diversity Section of Indiana Division of Fish and Wildlife coordinates Indiana's North American Amphibian Monitoring and Frog Watch Programs. These two programs collectively are the statewide effort to monitor frog and toad populations in Indiana, including bullfrogs. The data can be analyzed regionally.
- Waterfowl breeding status surveys, population surveys regionally; regional statewide trapping, banding, and recapture efforts
- Citizens and scientists report Kirtland's snake encounters to the Indiana Natural Heritage Database on a sporadic basis. Although sporadic these reports are often sufficient to demonstrate persistent Kirtland's snake occupied sites. However, the environmental parameters of these sites have not been adequately studied or described to reveal important micro-habitat associations
- DNR monitors most nest sites in the state and obtains information from other states

Respondents listed regional or local monitoring by other organizations for wildlife in all developed lands habitats in Indiana (not ranked):

- Ducks Unlimited conducts waterfowl surveys
- Breeding and population surveys
- Building managers and volunteers report nesting activity at many nests

Respondents listed organizations that monitor wildlife in all developed lands habitats in Indiana (not ranked):

- U.S. Fish and Wildlife Service
- Indiana Division of Fish and Wildlife
- Ducks Unlimited
- Indiana Division of Parks and Reservoirs
- Waterfowl USA
- Wildlife Diversity Section of the Indiana Division of Fish and Wildlife accepts sighting information as does the Division of Nature Preserves for inclusion in the Heritage Database
- Private companies (NIPSCO, Ispat Inland, building managers)
- Federal Breeding Bird Survey serves this function. It does not focus on suitable habitat; yet, occurrence on these surveys would be tied to nearby presence of this breeding habitat

Respondents considered monitoring techniques for wildlife in all developed lands habitats in Indiana:

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Monitoring techniques for wildlife in all developed lands habitats	Used	Not used but possible with existing technology and data	Not economically feasible
Radio telemetry and tracking	--	X	X
Modeling	X	X	--
Coverboard routes	--	X	--
Spot mapping	X	--	--
Driving a survey route	X	X	--
Reporting from harvest, depredation, or unintentional take (road kill, by-catch)	X	--	--
Mark and recapture	X	X	--
Professional survey/census	X	X	--
Volunteer survey/census	X	X	--
Trapping (by any technique)	X	X	--
Representative sites	X	X	--
Probabilistic sites	X	X	--

Respondents noted other monitoring techniques for wildlife in all developed lands habitats in Indiana (not ranked):

- Aerial surveys
- Bullfrog tadpoles and adults are often recorded during amphibian surveys of particular sites, such as a military base or Superfund sites. Bullfrogs are also encountered and recorded during fish surveys
- A standardized protocol could be developed as suggested by Gibson and Kingsbury 2004. However, a more difficult question might be where should the standardized protocol be implemented to provide an adequate picture of the status of the Kirtland's snake in Indiana
- Surveys for colonies and periodic censuses of nests/populations

Technical experts and conservation organizations reviewed the above results and were asked if these were a reasonable representation of the monitoring techniques for wildlife in all developed lands habitats. There were no responses.

Habitat inventory and assessment

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Respondents were aware of the following inventory and assessment efforts by state agencies for all developed lands habitats in Indiana (not ranked):

- Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment
- Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment

Respondents were aware of no inventory and assessment efforts by other organizations for all developed lands habitats in Indiana.

Respondents ranked inventory and assessment efforts by state agencies based on their importance for conservation of all developed lands habitats in Indiana:

Rank	Inventory and assessment by state agencies for conservation of all developed lands habitats
1	Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment
2 (tie)	Statewide annual inventory and assessment
2 (tie)	Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment
3	Statewide once-a-year inventory and assessment

Respondents ranked inventory and assessment efforts by other organizations based on their importance for conservation of all developed lands habitats in Indiana:

Rank	Inventory and assessment by other organizations for conservation of all developed lands habitats
1	Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment
2	Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment
3	Statewide once-a-year inventory and assessment

Respondents listed regional or local inventory and assessment by state agencies for all developed lands habitats in Indiana (not ranked):

- At this time, the habitat characteristics of Kirtland's snakes are not sufficiently defined to be monitored by general habitat measures (such as habitat classification based on remote sensing). More information on Kirtland's snake habitat requirements is needed to

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- define a habitat model for this species and to monitor the distribution and abundance of suitable habitat in the state
- Opportunistic statewide determination of potential nest sites in Indiana with the idea of erecting a nest box

Respondents were aware of no regional or local inventory and assessment by other organizations agencies for all developed lands habitats in Indiana. They did not list organizations that monitor this habitat.

Respondents considered inventory and assessment techniques for all developed lands habitats in Indiana:

Inventory and assessment techniques for all developed lands habitats	Used	Not used but possible with existing technology and data	Not economically feasible
GIS mapping	X	X	--
Aerial photography and analysis	X	X	X
Systematic sampling	--	X	--
Participation in land use programs	--	X	--
Modeling	--	X	--
Voluntary landowner reporting	X	--	--

Respondents listed additional inventory and assessment techniques for all developed lands habitats in Indiana (not ranked):

- If there was a significant decline in bullfrog habitat on state owned properties the state would hear about it from frog hunters
- Insufficient data on Kirtland's snake habitat
- Habitat for some wildlife species means suitable nesting sites near water. Volunteer participation in building a database of known breeding colonies and volunteer periodic censusing of colony sizes

Technical experts and conservation organizations reviewed the above results and were asked if these were a reasonable representation of the inventory and assessment techniques for all developed lands habitats. There were no responses.

Recommended monitoring Species monitoring

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Respondents recommended the following monitoring techniques for effective conservation of wildlife in all developed lands habitats in Indiana (not ranked):

- Neck collars and leg bands; driving surveys
- Population surveys
- Mallards
 - Mark and recapture
 - Modeling to determine population dynamics and evaluate genetic integrity of Mallards in developed lands versus "wild" mallards (i.e., mallards in undeveloped areas)
- Monitoring throughout annual cycle
- I do not believe that an effective nationally or regionally accepted monitoring technique exists. This should be identified as a need in the CWS
- Nest monitoring of all known nests (or representative sample) with two to three visits according to U.S. Fish and Wildlife Service protocol
- Surveys for colonies and periodic censuses of nests/populations

Technical experts and conservation organizations reviewed the above results and were asked if these were a reasonable representation of the monitoring techniques for effective conservation of wildlife in all developed lands habitats. There were no responses.

Habitat inventory and assessment

Respondents recommended the following inventory and assessment techniques for effective conservation of all developed lands habitats in Indiana (not ranked):

- Aerial Photography and modeling
- Urban residents could be encouraged to participate in the Frog Watch program
- Aerial spring surveys
- Insufficient data on Kirtland's snake habitat
- Only casual assessment needed
- Habitat for some wildlife species means suitable nesting sites near water. Volunteer participation in building a database of known breeding colonies and volunteer periodic censusing of colony sizes.

Technical experts and conservation organizations reviewed the above results and were asked if these were a reasonable representation of the inventory and assessment techniques for effective conservation of all developed lands habitats. There were no responses.