6

CHAPTER VI.

INDIANA'S PLANNING REGIONS

INDIANA'S SWAP INCLUDES PLANNING REGIONS TO BETTER FOCUS ACTIONS AND PRIORITIES BASED ON REGIONAL RESOURCES, NEEDS, AND THREATS.

OUTLINE

A. Great Lakes Region
B. Kankakee Region
C. Corn Belt Region
D. Valleys and Hills Region
E. Interior Plateau Region
F. Drift Plains Region

A. GREAT LAKES REGION

Figure 6-1. Outline of the Great L

Introduction

This section summarizes habitat conditions, threats to SGCN and their habitats, and conservation actions for species and habitats in the Great Lakes Region. This section also reviews land cover changes over the past decade and identifies unique habitat types in this region. Summaries of threats to and conservation actions for SGCN and their habitats that were generated from two surveys can be found at the end of this section.

In addition to the threats and actions identified in the Habitat Survey and the Species Survey, the DFW recognized the need to identify threats aligned with specific actions. Several threats and actions were identified as ubiquitous across all six regions. These include:

- **Habitat Loss:** Develop and promote farming technologies and practices that have conservation benefits (e.g., cover crops, no-till, and soil health)
- **Invasive Species:** Build external capacity (form and facilitate partnerships, alliances, and networks of organizations to address invasive species)
- **Law and Policy:** Develop, change, influence, and help implement formal legislation, regulations and voluntary standards
- **Dams and Water Management and Use:** Remove unnecessary dams and utilize necessary dams with effective fish passage structures

The DFW also identified specific threats and actions for each SWAP region based on DFW priorities. These threats were identified due to their high level of relevancy to the specific region and the workability of the associated actions. These threats and actions for the Great Lakes Region include:

- **Fish Passage:** Remove dams and create fish ladders
- **Pollution:** Reduce nutrient and toxin loads (e.g., heavy metals, pharmaceuticals, fertilizers, and pesticides)
- **Habitat Loss to Barrens and Bogs/Fens:** Build external capacity by forming partnerships and networks, raising and providing funds and resources for conservation organizations to maintain and protect barrens and bogs/fens

Current Habitat Conditions

During the Species Survey, respondents were asked to identify SGCN within the Great Lakes Region. A full summary of the Species Survey results can be found in Appendix O.

Table 6-1. SGCN present in the Great Lakes Region.

Taxa	Scientific Name	Common Name
Amphibians	*Necturus maculosus*	Common Mudpuppy
Amphibians	*Ambystoma laterale*	Blue-spotted Salamander
Amphibians	*Hemidactylium scutatum*	Four-toed Salamander
Amphibians	*Acris blanchardi*	Blanchard's Cricket Frog
Birds	*Cygnus buccinator*	Trumpeter Swan
Birds	*Colinus virginianus*	Northern Bobwhite
Birds	*Chordeiles minor*	Common Nighthawk
Birds	*Antrostomus vociferus*	Eastern Whip-poor-will
Birds	*Laterallus jamaicensis*	Black Rail
Birds	*Rallus elegans*	King Rail
Birds	*Rallus limicola*	Virginia Rail
Birds	*Gallinula galeata*	Common Gallinule
Birds	*Grus canadensis*	Sandhill Crane
Birds	*Grus americana*	Whooping Crane
Birds	*Pluvialis dominica*	American Golden-plover
Birds	*Charadrius melodus*	Piping Plover
Birds	*Bartramia longicauda*	Upland Sandpiper
Birds	*Arenaria interpres*	Ruddy Turnstone
Birds	*Calidris canutus rufa*	Rufa Red Knot
Birds	*Calidris subruficollis*	Buff-breasted Sandpiper
Birds	*Limnodromus griseus*	Short-billed Dowitcher
Birds	*Scolopax minor*	American Woodcock
Birds	*Tringa solitaria*	Solitary Sandpiper
Birds	*Tringa melanoleuca*	Greater Yellowlegs
Birds	*Phalaropus tricolor*	Wilson's Phalarope
Birds	*Sternula antillarum athalassos*	Interior Least Tern
Birds	*Chlidonias niger*	Black Tern
Birds	*Botaurus lentiginosus*	American Bittern
Birds	*Ixobrychus exilis*	Least Bittern
Birds	*Ardea alba*	Great Egret
Birds	*Nycticorax nycticorax*	Black-crowned Night-heron
Birds	*Pandion haliaetus*	Osprey
Birds	*Ictinia mississippiensis*	Mississippi Kite
Birds	*Haliaeetus leucocephalus*	Bald Eagle
Birds	*Circus cyaneus*	Northern Harrier
Birds	*Accipiter striatus*	Sharp-shinned Hawk
Birds	*Buteo platypterus*	Broad-winged Hawk
Birds	*Tyto alba*	Barn Owl
Birds	*Asio flammeus*	Short-eared Owl
Birds	*Falco peregrinus*	Peregrine Falcon
Birds	*Lanius ludovicianus*	Loggerhead Shrike
Birds	*Cistothorus platensis*	Sedge Wren
Birds	*Cistothorus palustris*	Marsh Wren
Birds	*Ammodramus henslowii*	Henslow's Sparrow
Birds	*Xanthocephalus xanthocephalus*	Yellow-headed Blackbird

Taxa	Scientific Name	Common Name
Birds	*Sturnella neglecta*	Western Meadowlark
Birds	*Helmitheros vermivorum*	Worm-eating Warbler
Birds	*Vermivora chrysoptera*	Golden-winged Warbler
Birds	*Mniotilta varia*	Black-and-white Warbler
Birds	*Setophaga citrina*	Hooded Warbler
Birds	*Setophaga kirtlandii*	Kirtland's Warbler
Birds	*Setophaga cerulea*	Cerulean Warbler
Fish	*Ichthyomyzon fossor*	Northern Brook Lamprey
Fish	*Acipenser fulvescens*	Lake Sturgeon
Fish	*Anguilla rostrata*	American Eel
Fish	*Notropis anogenus*	Pugnose Shiner
Fish	*Rhinichthys cataractae*	Longnose Dace
Fish	*Coregonus artedi*	Cisco
Fish	*Moxostoma valenciennesi*	Greater Redhorse
Fish	*Percopsis omiscomaycus*	Trout-perch
Fish	*Cottus cognatus*	Slimy Sculpin
Mammals	*Condylura cristata*	Star-nosed Mole
Mammals	*Myotis lucifugus*	Little Brown Myotis
Mammals	*Myotis septentrionalis*	Northern Long-eared Myotis
Mammals	*Myotis sodalis*	Indiana Myotis
Mammals	*Lasionycteris noctivagans*	Silver-haired Bat
Mammals	*Nycticeius humeralis*	Evening Bat
Mammals	*Lasiurus borealis*	Eastern Red Bat
Mammals	*Lasiurus cinereus*	Hoary Bat
Mammals	*Spermophilus franklinii*	Franklin's Ground Squirrel
Mammals	*Ursus americanus*	Black Bear
Mammals	*Mustela nivalis*	Least Weasel
Mammals	*Taxidea taxus*	American Badger
Mollusks	*Lampsilis fasciola*	Wavyrayed Lampmussel
Mollusks	*Pleurobema clava*	Clubshell
Mollusks	*Ptychobranchus fasciolaris*	Kidneyshell
Mollusks	*Simpsonaias ambigua*	Salamander Mussel
Mollusks	*Venustaconcha ellipsiformis*	Ellipse
Mollusks	*Villosa fabalis*	Rayed Bean
Mollusks	*Villosa lienosa*	Little Spectaclecase
Mollusks	*Campeloma decisum*	Pointed Campeloma
Mollusks	*Lymnaea stagnalis*	Swamp Lymnaea
Reptiles	*Clemmys guttata*	Spotted Turtle
Reptiles	*Emydoidea blandingii*	Blanding's Turtle
Reptiles	*Terrapene carolina*	Eastern Box Turtle
Reptiles	*Thamnophis butleri*	Butler's Gartersnake
Reptiles	*Thamnophis radix*	Plains Gartersnake
Reptiles	*Thamnophis proximus*	Western Ribbonsnake
Reptiles	*Nerodia erythrogaster neglecta*	Copper-bellied Watersnake
Reptiles	*Clonophis kirtlandii*	Kirtland's Snake
Reptiles	*Opheodrys vernalis*	Smooth Greensnake
Reptiles	*Sistrurus catenatus*	Eastern Massasauga

During the Habitat Survey, respondents were asked to evaluate the overall quality of fish and wildlife habitats in the Great Lakes Region (Fig. 6-2), estimate changes in overall quality since 2005 (Fig. 6-3), and predict changes in overall quality over the next ten years (Fig. 6-4). Each respondent was asked to respond for one or more of the eight major habitat types within the region and results were aggregated at the regional level. A full list of the Habitat Survey results can be found in Appendix P.

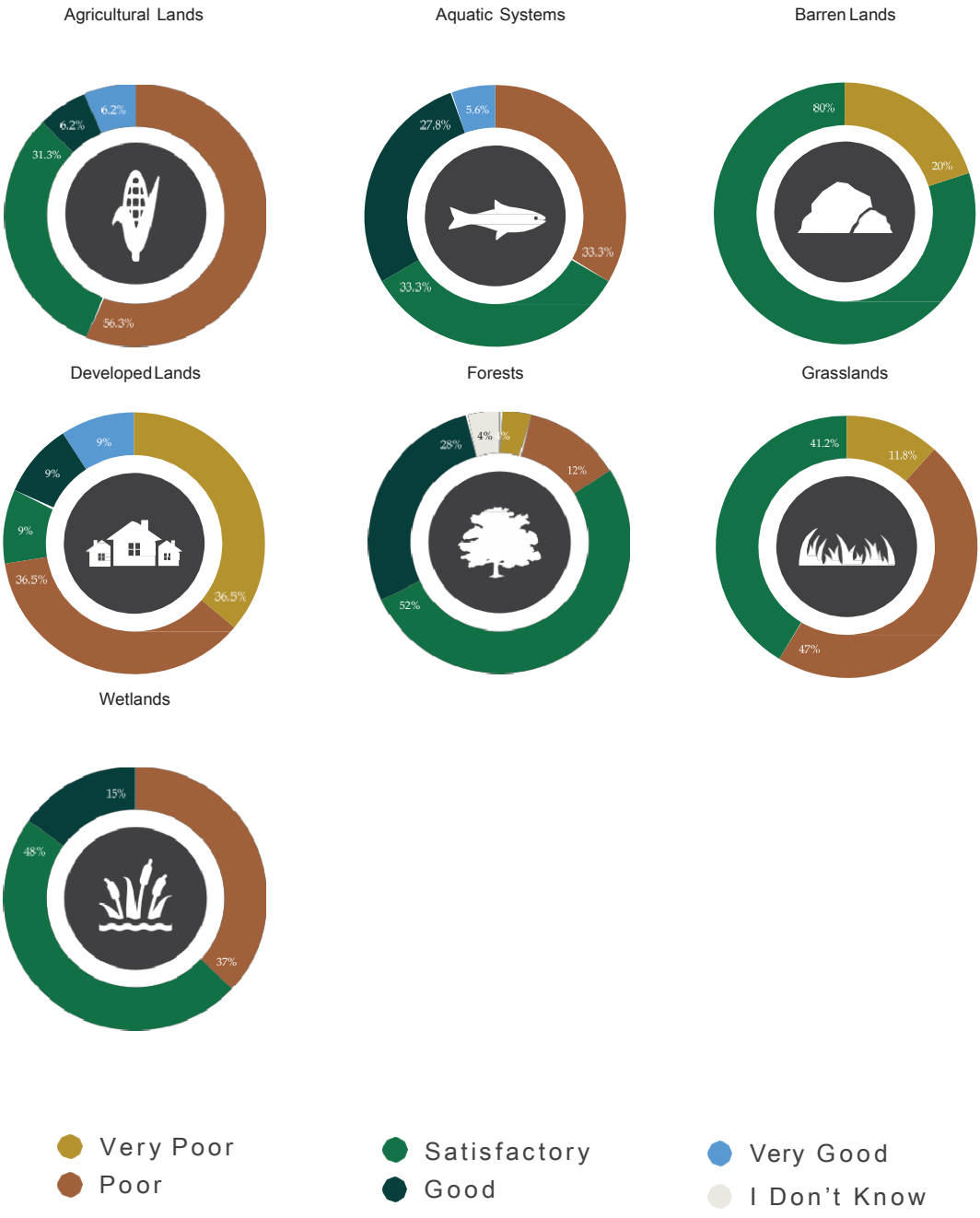


Figure 6-2. Overall quality of fish and wildlife habitats in the Great Lakes Region in 2014.

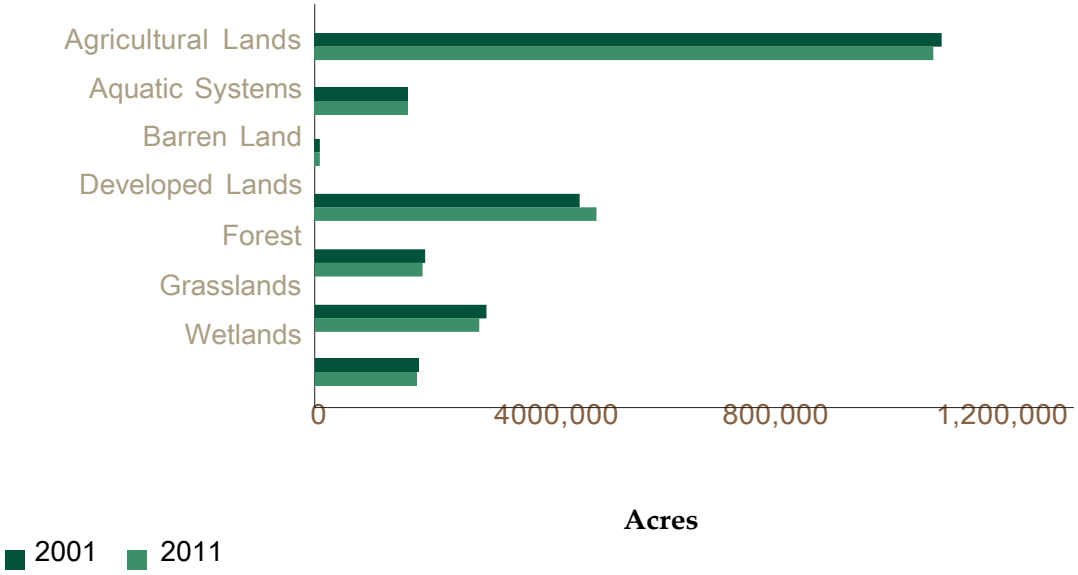
Figure 6-3. Estimated change in the overall quality of fish and wildlife habitats from 2005 to 2014 for each of the major habitat types in the Great Lakes Region.

Figure 6-4. Predicted changes in overall quality of fish and wildlife habitats over the next ten years for each major habitat type in the Great Lakes Region.

Changes in Land Cover

Most land cover in the Great Lakes Region consists of agricultural lands and developed lands, followed by grasslands, wetlands, and forests (Fig. 6-5). Compared to other Indiana regions, the Great Lakes Region has a high percentage of aquatic systems, mainly due to the presence of Lake Michigan. The region is comprised of 20.4% developed lands, as most of the surrounding Lake Michigan and Chicago-area is developed, and 7.4% wetlands, due to the extensive wetland complexes present in the Eastern portion of the region.

Although the aquatic systems have increased marginally, the Great Lakes Region has experienced loss in most habitat types over the past ten years. Most habitats were lost to urban development, and agriculture lost the most cover in terms of total acreage (Fig. 6-5). Percentage-wise, the greatest net losses were seen in grasslands (3.2%), forests (1.7%), and wetlands (1.4%). The greatest net increases percentage-wise were seen in barren lands (8.3%) and developed lands (6.2%).



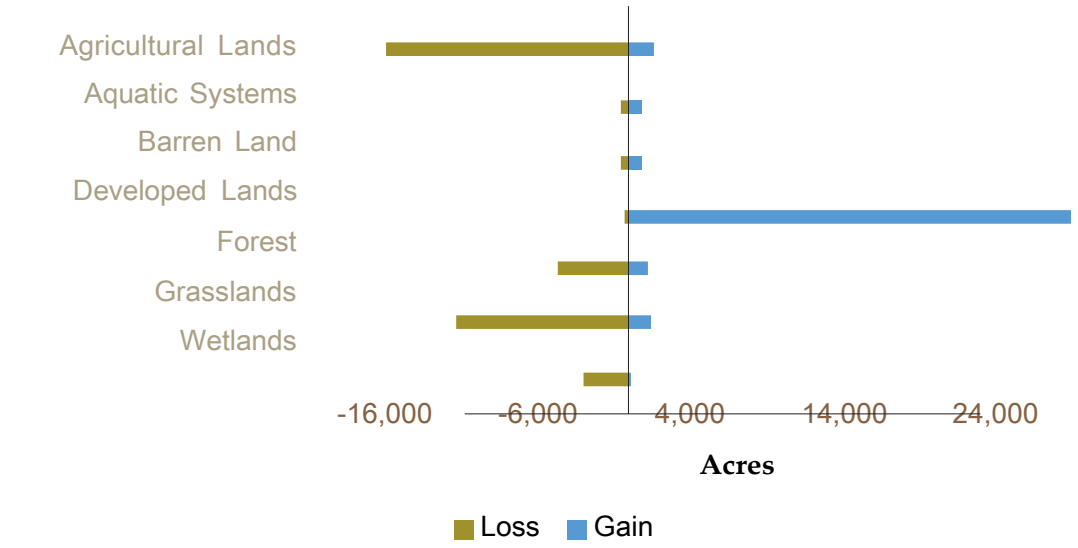


Figure 6-5. Distribution of land cover and losses and gains in land cover in the Great Lakes Region between 2001 and 2011 from NLCD.

Threats Affecting Habitats

Top Threat Categories

The third element requires the description of threats to SGCN and their habitats. The SWAP identifies a habitat perspective in order to manage for the conservation of species in Indiana. This section utilizes the same hierarchical method of identifying and rating threats based on Salafsky et al. (2008) that was outlined in Chapter V. Category rankings and specific threat rankings for habitats in this region are outlined below (Table 6-2). A full summary of the Habitat Survey results for the Great Lakes Region can be found in Appendix P.

For first-level threat categories, invasive and other problematic species and genes, residential and commercial development, agriculture and aquaculture, natural systems modification, pollution, and human intrusion and disturbance had a mean ranking between significant and moderate threat level. Climate change and severe weather, transportation and service corridors, other stressors, biological resource use, and energy production and mining received average ratings between moderate and minor threat. No threat category landed in the minor to no threat range for this region.

The invasive and other problematic species and genes category was identified as the top first-level threat across the region and in each of the major habitat types except for barren lands and developed lands, where it was ranked second and third, respectively.

Within the category, the invasive and alien species category was identified as the top specific second-level threat. Residential and commercial development, including non-agricultural land uses such as housing development and urban areas, was ranked second overall for the region and first as a threat to barren lands and habitats within developed lands. Shoreline development along Lake Michigan and destruction of riparian habitat from development were specifically identified as residential and commercial development threats within this region. Agriculture and aquaculture also generally ranked high regionally and across all habitat types except barren lands and developed lands. Within the category, conversion of habitat to annual crops and already existing non-timber crops were identified as the most significant threats, while aquaculture and timber production received ratings between the minor to no threat range. Changes to drainage through tile installation and nutrient loading were identified as other threats by respondents especially in aquatic systems in this region. Loss of CRP was also identified as a concern.

Climate change and other severe weather received a moderate to minor threat ranking regionally and within each habitat type; however, the majority of respondents anticipated specific threats within this category to increase in significance over the next ten years. Pollution received a high threat ranking within barren lands and developed lands compared to the rest of the habitat types. Other stressors and biological resource use were ranked uniformly low across habitat types within this region. Energy production and mining was also ranked low regionally. Some respondents specifically identified wind farm installation development as a potential threat in this region.

Table 6-2. Threat category ranking to habitats in the Great Lakes Region. First-level threats categories are based on the hierarchical method of identifying threats outlined in Salafsky et al. (2008). Ranked threat categories for the entire region are arranged by each major habitat type (1 - highest threat).

Category	Regional Ranking	Aquatic Systems	Agricultural Lands	Barren Lands	Developed Lands	Forests	Grasslands	Wetlands
Invasive and Other Problematic Species and Genes	1	1	1	2	3	1	1	1
Residential and Commercial Development	2	4	3	1	1	2	3	4
Agriculture and Aquaculture	3	3	4	7	10	4	2	3
Natural Systems Modification	4	6	2	6	5	3	4	2
Pollution	5	2	5	3	2	6	8	6
Human Intrusion and Disturbance	6	5	7	4	4	5	5	5
Climate Change and Severe Weather	7	7	6	8	7	7	6	7
Transportation and Service Corridors	8	8	8	5	6	9	7	8
Other Stressors	9	9	9	9	8	8	9	9
Biological Resource Use	10	11	10	11	9	10	11	10
Energy Production and Mining	11	10	11	10	11	11	10	11

Top Specific Threats in Ranked Order

In the Habitat Survey, respondents were also asked to identify specific threats to major habitat types using the same threat category ranking system outlined in Salafsky et al. (2008). These second-level threats represent subcategories of threats within the major threat categories listed in the table above. The following are the top specific second-level threats to habitats in the Great Lakes Region, aggregated across habitat types:

1. Invasive and alien species
2. Conversion of natural habitats to other land uses
3. Changing frequency, duration, and intensity of drought
4. Changing frequency, duration, and intensity of floods
5. Housing and urban areas
6. Conversion of habitat to annual crops
7. Shifting and alteration of habitats due to climate change
8. Commercial and industrial areas
9. Temperature extremes due to climate change
10. Annual and perennial non-timber crops

In the Species Survey, respondents were also asked to identify threats to individual SGCN using the same threat category ranking system. The following are the top specific second-level threats to SGCN occurring in the Great Lakes Region, aggregated across all species:

1. Natural habitat conversion
2. Conversion of habitat to annual crops
3. Annual and perennial non-timber crops
4. Dams and water management and use
5. Livestock farming and ranching
6. Over-mowing of natural areas

Emerging/Anticipated Threats

Respondents were asked specifically to identify any emerging or anticipated threats over the next ten years for fish and wildlife habitats within the major habitat types for a region in a free-response question.

Respondents identified a concern for continued introduction and spread of invasive species, including Asian Carp in aquatic systems and exotic plant species. Although pollution was mid-ranked for current threats, contaminants like pharmaceuticals and pesticides, as well as plastics in the form of micro-beads, were identified as emerging specific threats in aquatic systems in this region. Respondents also reported an anticipated threat to conservation may be the lack of land being set aside for protection by state agencies as well as loss of the CRP.

Conservation Actions Needed

Top Action Categories

The fourth element requires that the SWAP describe conservation actions proposed to conserve identified species and habitats as well as outlining priorities for their implementation. This section outlines conservation actions identified at the regional level for each of the major habitat types. This section follows the same protocol to rate and rank actions in this region based on Salafsky et al. (2008) that was outlined in Chapter V. A full list of survey results can be found in Appendix P. Category rankings for actions and specific actions are outlined in the list on the following page (Table 6-3).

Land, water, and species management was ranked as the most important first-level category of actions regionally and in aquatic systems, barren lands, and wetlands specifically. Within the categories, means were used to determine the rankings. Because of this, some habitat-specific options with few respondents may have high means regionally. Overall, important actions reflected respondents identifying a need to control invasive species and restore habitats and natural systems in various habitat types. Reducing loss of habitat due to agricultural and residential development was identified as one of the highest rated actions across several habitat types. Reducing nutrient toxin load was also tied for the highest rated action in aquatic systems within land, water, and species management.

Education and awareness was also highly ranked for this region, ranking second regionally and first for agricultural lands, developed lands, forests, and grasslands. Education in general was ranked highest within the category, but

three of the four actions in this category received a rating from respondents between very important and moderately important. Through the free-response option, respondents also indicated a general importance for public participation in conservation through opportunities for stakeholder engagement and development of educational programs specifically addressing topics related to natural lakes and climate change.

Within the law and policy top-level category, respondents emphasized an importance for compliance of current regulations over creation of new ones in general, though some respondents did suggest improving regulations on invasive species, as well as changing regulations with regards to drainage and agricultural runoff.

External capacity building was ranked last regionally, below livelihood, economic and other incentives; however, all categories of actions received an average rating between very important and moderately important. Of the 93 specific second-level conservation actions rated by respondents for this region, 73 received a rating between very important to moderately important. This indicated respondents identifying a range of actions that are vital to conservation within this region across the major habitat types.

Table 6-3. Action category rankings to habitats in the Great Lakes Region. First-level categories are based on the hierarchical method of identifying actions outlined in Salafsky et al. (2008). Ranked action categories for the entire region are broken up by each major habitat type. Additional habitat ranking information and Habitat Survey responses can be found in Appendix P.

Category	Regional Ranking	Aquatic Systems	Agricultural Lands	Barren Lands	Developed Lands	Forests	Grasslands	Wetlands
Land/Water/Species Management	1	1	2	1	2	3	3	1
Education and Awareness	2	2	1	3	1	1	1	4
Land/Water Protection	3	3	5	1	2	2	2	2
Law and Policy	4	4	4	4	4	5	5	3
Livelihood, Economic and Other Incentives	5	5	3	4	4	6	6	6
External Capacity Building	6	6	6	4	4	4	4	5

Top Specific Actions in Ranked Order

In the Habitat Survey, respondents were also asked to identify specific actions for major habitat types using the same action category ranking system outlined in Salafsky et al. (2008). These second-level actions represent subcategories of actions within the major action categories listed in the table above. The following are the top specific second-level conservation actions for habitats in the Great Lakes

Region, aggregated across habitat types:

1. Reduce loss of fish and wildlife habitats (due to agriculture, urban sprawl, commercial development, etc.)
2. Preserve currently existing corridors
3. Promote use of research and science in conservation decision-making processes
4. Acquire conservation easements to protect important wildlife habitats
5. Reduce nutrient and toxin loads (e.g., heavy metals, pharmaceuticals, fertilizers, insecticides)
6. Develop alliances and partnerships (e.g., between producers, landowners, and conservation professionals)
7. Develop educational programs in general
8. Develop and promote farming technologies and practices that have conservation benefits (e.g., cover crops, no-till, and soil health)
9. Strengthen conservation financing
10. Increase acres of riparian buffers

In the Species Survey, respondents used a free-response question to discuss the most relevant conservation actions for individual SGCN. The following are top actions for SGCN occurring in the Great Lakes Region, as summarized from these free-response questions:

1. Educate and engage with landowners and citizens
2. Enhance connectivity of habitats
3. Increase CRP lands
4. Protect large contiguous forested areas
5. Limit conversion of habitat to non-habitat
6. Control invasive plants
7. Minimize disturbance to nesting birds
8. Use burning and mowing as management techniques
9. Protect and manage large wetland complexes

Prioritization of Actions

In order to prioritize these actions within an environment of limited resources, respondents were then asked to distribute hypothetical “effort points” to any action they had previously rated as “very important” for any of the major habitat types within a region. The effort ratings were averaged and then ranked to identify the top five actions for each region. A full list of these results can be found in Appendix

P. Priority actions for the Great Lakes Region include:

1. Control invasive species in aquatic systems (e.g., Asian Carp, Zebra Mussels,

invasive aquatic plants)
2. Develop and promote farming technologies and practices that have conservation benefits (e.g., cover crops, no-till, and soil health)
3. Reduce loss of fish and wildlife habitats (due to agriculture, urban sprawl, commercial development, etc.)
4. Develop educational programs in general
5. Reduce nutrient and toxin loads (e.g., heavy metals, pharmaceuticals, fertilizers, insecticides)

These top priority actions, sorted by average effort rating, reflect actions from land, water, andspeciesmanagementandeducationandawareness. Respondents placed an emphasis on conservation actions in aquatic systems in this region, as both controlling invasive species in this habitat type and reducing nutrient toxin load will directly benefit fish and wildlife habitats in aquatic systems.

Threats and Actions by Major Habitat Type

The following summaries break down threats and conservation actions in this region by major habitat type, based on responses to the Habitat Survey and the Species Survey. The SGCN that occur there, top threats to SGCN, top actions for SGCN, key threats to habitats, and priority actions for each major habitat type in this region are summarized on the following pages.

Threats and actions were only included in detail below if a majority of eligible survey respondents, greater than 50%, rated them, to avoid artificially elevating items, which were highly ranked but only by a few respondents. This approach left some threats and action lists with no items for certain habitats, which is illogical from a practical perspective. Therefore, in these situations, the top threats and actions are still listed but are denoted with an asterisk (*) to signify that there may be some items, which seem out-of-place, reflecting a lack of sufficient response for a particular habitat in the survey. This approach and the survey design also caused for some disparities between threats and actions.

Approximately ten items are given for each list below. Lists may be shorter if fewer than ten items were rated by a majority of survey respondents, or longer if there were ties between items.

Top actions for SGCN were summarized from free-response questions about individual species and do not follow the same categorizations as actions for habitats. A full summary of the Habitat Survey responses can be found in Appendix P.

Agricultural Lands

Agricultural lands are defined as lands devoted to commodity production. Examples of agricultural lands include: intensively managed non-native grasses, row crops, fruit and nut-bearing trees, confined feeding operations, and feedlots.

Top threats to SGCN occurring in agricultural lands in the Great Lakes Region:

1. Natural habitat conversion
2. Conversion of habitat to annual crops
3. Annual and perennial non-timber crops

Top conservation actions for SGCN occurring in agricultural lands in the Great Lakes Region:

1. Educate and engage with landowners and citizens (benefits all species)
2. Enhance connectivity of forests and grasslands surrounding agricultural lands (benefits all species)
3. Increase use of CRP partnerships (benefits all species)
4. Implement agricultural practices that improve water quality in aquatic systems and wetlands (for aquatic and wetland species)
5. Maintain shallow-water areas for migrating shorebirds

Top threats to fish and wildlife habitats in agricultural lands in the Great Lakes Region:

1. Conversion of natural habitats to other land uses
2. Conversion of habitat to annual crops
3. Invasive and alien species
4. Changing frequency, duration, and intensity of drought
5. Changing frequency, duration, and intensity of floods
6. Housing and urban areas
7. Agriculture, residential, and forestry effluents
8. Household sewage and urban water waste
9. Introduced genetic material (such as crop, seed stock, bio-control, stocked/released species, etc.)
10. Point source pollution from commercial and industrial sources

Top conservation actions for fish and wildlife habitats in agricultural lands in the Great Lakes Region:

1. Acquire conservation easements to protect important wildlife habitats
2. Restore and integrate diversity of habitats into crop-production dominated landscapes
3. Build and strengthen CRP partnerships
4. Preserve currently existing corridors
5. Link existing habitat blocks through corridor enhancement in agricultural lands
6. Reduce loss of fish and wildlife habitats (due to agriculture, urban sprawl, commercial development, etc.)
7. Increase acres of riparian buffers
8. Promote use of research and science in conservation decision-making processes
9. Develop and promote farming technologies and practices that have conservation benefits (e.g., cover crops, no-till, and soil health)
10. Develop education programs in general

Aquatic Systems

Aquatic systems are defined as all water habitats, both flowing and stationary. Examples of aquatic systems include: manmade impoundments, natural lakes rivers, streams, oxbows, sloughs, embayments, and backwaters (not including wetlands).

Top threats to SGCN occurring in aquatic systems in the Great Lakes Region:

1. Natural habitat conversion
2. Conversion of habitat to annual crops
3. Housing and urban areas
4. Annual and perennial non-timber crops
5. Commercial and industrial areas
6. Dams and water management and use
7. Livestock farming and ranching
8. Tourism and recreation areas

Top conservation actions for SGCN occurring in aquatic systems in the Great Lakes Region:

1. Enhance public, stakeholder, and landowner education and awareness
2. Reduce sediment and nutrient loads
3. Reduce point and non-point source pollution
4. Protect and restore riparian buffer zones
5. Reconnect floodplains and rivers
6. Remove dams
7. Implement agricultural best management practices to improve water quality
8. Reduce flashiness in watersheds

Top threats to fish and wildlife habitats in aquatic systems in the Great Lakes Region:

1. Invasive and alien species
2. Changing frequency, duration, and intensity of floods
3. Annual and perennial non-timber crops
4. Agriculture, residential, and forestry effluents
5. Shifting and alteration of habitats due to climate change
6. Conversion of habitat to annual crops
7. Changing frequency, duration, and intensity of drought
8. Runoff from roads and service corridors
9. Temperature extremes
10. Commercial and industrial areas

Top conservation actions for fish and wildlife habitats in aquatic systems in the Great Lakes Region:

1. Reduce loss of fish and wildlife habitats (due to agriculture, urban sprawl, commercial development, etc.)
2. Reduce nutrient and toxin loads (e.g., heavy metals, pharmaceuticals, fertilizers, insecticides)
3. Preserve currently existing corridors
4. Acquire conservation easements to protect important wildlife habitats
5. Control invasive species in aquatic systems (e.g., Asian Carp, Zebra Mussels, invasive aquatic plants)
6. Develop and promote farming technologies and practices that have conservation benefits (e.g., cover crops, no-till, and soil health)

7. Protect and enhance undeveloped shorelines
8. Improve compliance with and enforcement of current policies
9. Protect adjacent buffer zones
10. Promote use of research and science in conservation decision-making processes

Barren Lands

Barren lands are defined as lands dominated by exposed rock or minerals with sparse vegetation. Examples of barren lands include: sand/dunes, rock outcrops, cliffs, and bare rock.

Top threats to SGCN occurring in barren lands in the Great Lakes Region:

1. Natural habitat conversion
2. Annual and perennial non-timber crops
3. Conversion of habitat to annual crops
4. Dams and water management and use
5. Over-mowing of natural areas
6. Fire and fire suppression

Top conservation actions for SGCN occurring in barren lands in the Great Lakes Region:

1. Educate public about Peregrine Falcon
2. Protect Bald Eagle nest sites
3. Maintain stopover habitat for Kirtland's Warbler along Lake Michigan shoreline

Top threats to fish and wildlife habitats in barren lands in the Great Lakes Region:

1. Invasive and alien species
2. Housing and urban areas
3. Problematic native species (e.g., overabundant native deer or algae)
4. Runoff from roads and service corridors
5. Commercial and industrial areas
6. Tourism and recreation areas (e.g., sites with a substantial footprint, such as golf courses, campgrounds, etc.)
7. Roads and railroads
8. Point source pollution from commercial and industrial sources
9. Agriculture, residential, and forestry effluents

Top conservation actions for fish and wildlife habitats in barren lands in the Great Lakes Region:

1. Acquire currently unprotected barren lands
2. Control invasive species in barren lands
3. Reduce loss of fish and wildlife habitats (due to agriculture, urban sprawl, commercial development, etc.)
4. Re-establish natural disturbance regimes in barren lands
5. Restore habitats and natural systems in barren lands
6. Preserve currently existing corridors

7. Protect adjacent buffer zones
8. Develop educational programs in general
9. Acquire conservation easements to protect important wildlife habitats
10. Link existing habitat blocks through corridor enhancement in barren lands
11. Establish training programs for stakeholders

Developed Lands

Developed lands are defined as highly impacted lands intensively modified to support human habitation, transportation, commerce, and recreation. Examples of developed lands include: urban lands, suburban lands, industrial areas, commercial areas, towers for communication and wind power generation, and recreational areas such as golf courses and soccer fields.

Top threats to SGCN occurring in developed lands in the Great Lakes Region:

1. Renewable energy production
2. Invasive and alien species
3. Diseases from domestic populations and unknown sources
4. Fossil fuel energy production
5. Mining and quarrying

Top conservation actions for SGCN occurring in developed lands in the Great Lakes Region:

1. Enhance public education and awareness about bat ecology and issues
2. Reduce urban sprawl and commercial property expansion
3. Manage urban areas for Peregrine Falcons; minimize disturbance during nesting
4. Increase gravel-surfaced rooftop habitat for breeding Common Nighthawks
5. Mitigate road hazards for wildlife

Top threats to fish and wildlife habitats in developed lands in the Great Lakes Region:

1. Conversion of natural habitats to other land uses
2. Housing and urban areas
3. Commercial and industrial areas
4. Temperature extremes
5. Runoff from roads and service corridors
6. Roads and railroads
7. Invasive and alien species
8. Changing frequency, duration, and intensity of floods
9. Shifting and alteration of habitats due to climate change
10. Dams and water management and use

Top conservation actions for fish and wildlife habitats in developed lands in the Great Lakes Region:

1. Preserve currently existing corridors
2. Acquire conservation easements to protect important wildlife habitats
3. Reduce loss of fish and wildlife habitats (due to agriculture, urban sprawl,

commercial development, etc.)
4. Reduce urban sprawl through planning and zoning
5. Promote green infrastructure
6. Develop educational programs in general
7. Link existing habitat blocks through corridor enhancement in developed lands
8. Restore and integrate diversity of habitats into developed landscapes
9. Control invasive species in developed lands
10. Promote use of research and science in conservation decision-making processes

Forests

Forests are defined as a plant community dominated by trees. Examples of forests include, but are not limited to, all stages of natural forest and plantations.

Top threats to SGCN occurring in forests in the Great Lakes Region:

1. Natural habitat conversion
2. Conversion of habitat to annual crops
3. Housing and urban areas
4. Annual and perennial non-timber crops
5. Invasive and alien species
6. Commercial and industrial areas
7. Diseases from domestic populations and unknown sources
8. Wood and pulp plantations
9. Fire and fire suppression
10. Tourism and recreation areas
11. Livestock farming and ranching
12. Over-mowing of natural areas
13. Recreation activities (e.g., ATVs, trail use, horseback riding, high-speed boating, canoeing)
14. Problematic native species (e.g., overabundant native deer or algae)

Top conservation actions for SGCN occurring in forests in the Great Lakes Region:

1. Protect large contiguous forested areas and reduce forest fragmentation
2. Limit conversion of forests to non-forest land uses
3. Control invasive woody plants to benefit Box Turtles, Whip-poor-wills, and other species
4. Reduce development in forested areas to benefit warblers and other species
5. Protect roost trees for bat species
6. Restore forests and woodlands (benefits all forest species)
7. Create small forest openings to increase diversity
8. Restrict clearing of forested bottomlands for Copper-bellied Water Snakes
9. Provide downed woody debris for the Least Weasel
10. Implement best management practices in forestry

Top threats to fish and wildlife habitats in forests in the Great Lakes Region:

1. Invasive and alien species
2. Housing and urban areas
3. Conversion of natural habitats to other land uses
4. Conversion of habitat to annual crops
5. Commercial and industrial areas
6. Changing frequency, duration, and intensity of drought
7. Point source pollution from commercial and industrial sources
8. Annual and perennial non-timber crops
9. Changing frequency, duration, and intensity of floods
10. Shifting and alteration of habitats due to climate change
11. Temperature extremes

Top conservation actions for fish and wildlife habitats in forests in the Great Lakes Region:

1. Preserve currently existing corridors
2. Reduce loss of fish and wildlife habitats (due to agriculture, urban sprawl, commercial development, etc.)
3. Acquire currently unprotected forests
4. Control invasive species in forests
5. Promote use of research and science in conservation decision-making processes
6. Link existing habitat blocks through corridor enhancement in forests
7. Restore habitats and natural systems in forests
8. Increase regulations on invasive species
9. Reduce conversion to cropland
10. Acquire conservation easements to protect important wildlife habitats

Grasslands

Grasslands are defined as an open area dominated by grass species. Examples of grasslands include: haylands, pasture, prairies, savannahs, or reclaimed mine lands.

Top threats to SGCN occurring in grasslands in the Great Lakes Region:

1. Conversion of habitat to annual crops
2. Annual and perennial non-timber crops

Top conservation actions for SGCN occurring in grasslands in the Great Lakes Region:

1. Restore and improve connectivity of grasslands (benefits all grassland species)
2. Reduce woody encroachment on grasslands to benefit the Massasauga, Sedge Wren, and other species
3. Increase CRP grasslands (benefits all grassland species)
4. Implement burning regimes (but plan around active seasons, such as when the smooth green snake is active)
5. Minimize disturbance to nesting grassland birds (e.g., Henslow's Sparrow)
6. Mow properly (reduce mowing for shorebirds and owls)

7. Improve grazing practices
8. Translocation program for Franklin's Ground Squirrels

Top threats to fish and wildlife habitats in grasslands in the Great Lakes Region:

1. Conversion of natural habitats to other land uses
2. Invasive and alien species
3. Conversion of habitat to annual crops
4. Fire and fire suppression
5. Housing and urban areas
6. Annual and perennial non-timber crops
7. Commercial and industrial areas
8. Introduced genetic material (such as crop, seed stock, bio-control, stocked/released species, etc.)
9. Recreation activities (e.g., ATVs, trail use, horseback riding, high-speed boating, canoeing)
10. Over-mowing of natural areas

Top conservation actions for fish and wildlife habitats in grasslands in the Great Lakes Region:

1. Strengthen conservation financing
2. Develop alliances and partnerships (e.g., between producers, landowners, and conservation professionals)
3. Control invasive species in grasslands
4. Acquire currently unprotected grasslands
5. Restore habitats and natural systems in grasslands
6. Promote use of research and science in conservation decision-making processes.
7. Reduce conversion to cropland
8. Reduce loss of fish and wildlife habitats (due to agriculture, urban sprawl, commercial development, etc.)
9. Promote conservation payment programs (e.g., payment for ecosystem services, conservation easements)
10. Preserve currently existing corridors
11. Build and strengthen CRP partnerships

Wetlands

Wetlands are defined as either ephemeral or permanently flooded habitat. Examples of wetlands include: swamps, marshes, bogs, fens, potholes, wetlands of farmed areas, and mudflats.

Top threats to SGCN occurring in wetlands in the Great Lakes Region:

1. Natural habitat conversion
2. Invasive and alien species
3. Conversion of habitat to annual crops
4. Housing and urban areas
5. Commercial and industrial areas
6. Annual and perennial non-timber crops

7. Dams and water management and use
8. Tourism and recreation areas
9. Problematic native species (e.g., overabundant native deer or algae)
10. Recreation activities (e.g., ATVs, trail use, horseback riding, high-speed boating, canoeing)
11. Fire and fire suppression

Top conservation actions for SGCN occurring in wetlands in the Great Lakes Region:

1. Protect and maintain large wetlands complexes
2. Restore wetlands
3. Protect buffers around wetlands
4. Control invasive plants in wetlands
5. Create shorebird management areas
6. In some cases, actively manage water levels (e.g., Black Tern, Common Gallinule)
7. Mitigate road hazards to amphibians and reptiles when roads cross over wetlands
8. Minimize disturbance to nesting turtles
9. Provide stopover and roosting habitat for cranes

Top threats to fish and wildlife habitats in wetlands in the Great Lakes Region:

1. Invasive and alien species
2. Conversion of natural habitats to other land uses
3. Agriculture, residential, and forestry effluents
4. Runoff from roads and service corridors
5. Housing and urban areas
6. Annual and perennial non-timber crops
7. Commercial and industrial areas
8. Conversion of habitat to annual crops
9. Point source pollution from commercial and industrial sources
10. Chemical spills

Top conservation actions for fish and wildlife habitats in wetlands in the Great Lakes Region:

1. Acquire currently unprotected wetlands
2. Restore habitats and natural systems in wetlands
3. Control invasive species in wetlands
4. Develop alliances and partnerships (e.g., between producers, landowners, and conservation professionals)
5. Promote use of research and science in conservation decision-making processes
6. Reduce loss of fish and wildlife habitats (due to agriculture, urban sprawl, commercial development, etc.)
7. Acquire conservation easements to protect important wildlife habitats.
8. Preserve currently existing corridors
9. Protect and enhance undeveloped shorelines
10. Protect adjacent buffer zones
11. Promote diversity of wetland types and successional stage

B. KANKAKEE REGION

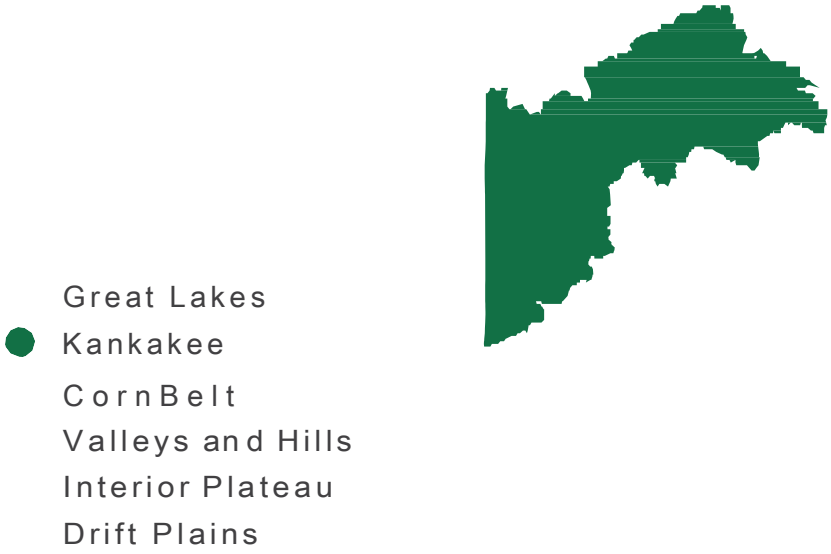


Figure 6-6. Outline of the Kankakee Region in Indiana for the SWAP.

Introduction

This section summarizes habitat conditions, threats to SGCN and their habitats, and conservation actions for species and habitats in the Kankakee Region. This section also reviews land cover changes over the past decade and identifies unique habitat types in this region. Summaries of threats to and conservation actions for SGCN and their habitats that were generated from two surveys can be found at the end of this section.

In addition to the threats and actions identified in the Habitat Survey and the Species Survey, the DFW recognized the need to identify threats aligned with specific actions. Several threats and actions were identified as ubiquitous across all sixregions. These include:

- **Habitat Loss:** Develop and promote farming technologies and practices that have conservation benefits (e.g., cover crops, no-till, and soilhealth)
- **Invasive Species:** Build external capacity (form and facilitate partnerships, alliances, and networks of organizations to address invasive species)
- **Law and Policy:** Develop, change, influence and help implement formal legislation, regulations and voluntary standards
- **Dams and Water Management and Use:** Remove unnecessary dams and utilize necessary dams with effective fish passage structures

The DFW also identified specific threats and actions for each SWAP region based on DFW priorities. These threats were identified due to their high level of relevancy to the specific region and the workability of the associated actions. These threats and actions for the Kankakee Region include:

- **Habitat Loss of Savannas and Prairies:** Build external capacity by forming partnerships and networks, raising and providing funds and resources for conservation organization to maintain and protect savannas
- **Establish Natural Disturbance Regimes in Savannas and Prairies**
- **Natural Systems Modifications:** Develop and promote farming technologies and practices that have conservation benefits for wetlands

Current Habitat Conditions

During the Species Survey, respondents were asked to identify SGCN within the Kankakee Region. A full summary of the Species Survey results can be found in Appendix O.

Table 6-4. Species of Greatest Conservation Need present in the Kankakee Region.

Taxa	Scientific Name	Common Name
Amphibians	*Necturus maculosus*	Common Mudpuppy
Amphibians	*Ambystoma laterale*	Blue-spotted Salamander
Amphibians	*Hemidactylium scutatum*	Four-toed Salamander
Amphibians	*Acris blanchardi*	Blanchard's Cricket Frog
Amphibians	*Lithobates blairi*	Plains Leopard Frog
Birds	*Cygnus buccinator*	Trumpeter Swan
Birds	*Colinus virginianus*	Northern Bobwhite
Birds	*Chordeiles minor*	Common Nighthawk
Birds	*Antrostomus vociferus*	Eastern Whip-poor-will
Birds	*Laterallus jamaicensis*	Black Rail
Birds	*Rallus elegans*	King Rail
Birds	*Rallus limicola*	Virginia Rail
Birds	*Gallinula galeata*	Common Gallinule
Birds	*Grus canadensis*	Sandhill Crane
Birds	*Grus americana*	Whooping Crane
Birds	*Pluvialis dominica*	American Golden-plover
Birds	*Charadrius melodus*	Piping Plover
Birds	*Bartramia longicauda*	Upland Sandpiper
Birds	*Arenaria interpres*	Ruddy Turnstone
Birds	*Calidris subruficollis*	Buff-breasted Sandpiper
Birds	*Limnodromus griseus*	Short-billed Dowitcher
Birds	*Scolopax minor*	American Woodcock
Birds	*Tringa solitaria*	Solitary Sandpiper
Birds	*Tringa melanoleuca*	Greater Yellowlegs
Birds	*Phalaropus tricolor*	Wilson's Phalarope
Birds	*Sternula antillarum athalassos*	Interior Least Tern
Birds	*Chlidonias niger*	Black Tern
Birds	*Botaurus lentiginosus*	American Bittern
Birds	*Ixobrychus exilis*	Least Bittern
Birds	*Ardea alba*	Great Egret
Birds	*Nycticorax nycticorax*	Black-crowned Night-heron
Birds	*Pandion haliaetus*	Osprey
Birds	*Haliaeetus leucocephalus*	Bald Eagle
Birds	*Circus cyaneus*	Northern Harrier
Birds	*Accipiter striatus*	Sharp-shinned Hawk
Birds	*Buteo platypterus*	Broad-winged Hawk
Birds	*Tyto alba*	Barn Owl

Taxa	Scientific Name	Common Name
Birds	*Asio flammeus*	Short-eared Owl
Birds	*Falco peregrinus*	Peregrine Falcon
Birds	*Lanius ludovicianus*	Loggerhead Shrike
Birds	*Cistothorus platensis*	Sedge Wren
Birds	*Cistothorus palustris*	Marsh Wren
Birds	*Ammodramus henslowii*	Henslow's Sparrow
Birds	*Xanthocephalus xanthocephalus*	Yellow-headed Blackbird
Birds	*Sturnella neglecta*	Western Meadowlark
Birds	*Helmitheros vermivorum*	Worm-eating Warbler
Birds	*Vermivora chrysoptera*	Golden-winged Warbler
Birds	*Mniotilta varia*	Black-and-white Warbler
Birds	*Setophaga citrina*	Hooded Warbler
Birds	*Setophaga cerulea*	Cerulean Warbler
Fish	*Ichthyomyzon fossor*	Northern Brook Lamprey
Fish	*Anguilla rostrata*	American Eel
Fish	*Notropis dorsalis*	Bigmouth Shiner
Fish	*Moxostoma valenciennesi*	Greater Redhorse
Mammals	*Condylura cristata*	Star-nosed Mole
Mammals	*Myotis lucifugus*	Little Brown Myotis
Mammals	*Myotis septentrionalis*	Northern Long-eared Myotis
Mammals	*Myotis sodalis*	Indiana Myotis
Mammals	*Lasionycteris noctivagans*	Silver-haired Bat
Mammals	*Nycticeius humeralis*	Evening Bat
Mammals	*Lasiurus borealis*	Eastern Red Bat
Mammals	*Lasiurus cinereus*	Hoary Bat
Mammals	*Spermophilus franklinii*	Franklin's Ground Squirrel
Mammals	*Geomys bursarius*	Plains Pocket Gopher
Mammals	*Mustela nivalis*	Least Weasel
Mammals	*Taxidea taxus*	American Badger
Mollusks	*Cyprogenia stegaria*	Fanshell
Mollusks	*Venustaconcha ellipsiformis*	Ellipse
Mollusks	*Campeloma decisum*	Pointed Campeloma
Mollusks	*Lymnaea stagnalis*	Swamp Lymnaea
Reptiles	*Kinosternon subrubrum*	Eastern Mud Turtle
Reptiles	*Clemmys guttata*	Spotted Turtle
Reptiles	*Emydoidea blandingii*	Blanding's Turtle
Reptiles	*Terrapene carolina*	Eastern Box Turtle
Reptiles	*Terrapene ornata*	Ornate Box Turtle
Reptiles	*Thamnophis proximus*	Western Ribbonsnake
Reptiles	*Clonophis kirtlandii*	Kirtland's Snake
Reptiles	*Opheodrys vernalis*	Smooth Greensnake
Reptiles	*Sistrurus catenatus*	Eastern Massasauga

During the Habitat Survey, respondents were asked to evaluate the overall quality of fish and wildlife habitats in the Kankakee Region (Fig. 6-7), estimate changes in overall quality since 2005 (Fig. 6-8), and predict changes in overall quality over the next ten years (Fig. 6-9). Each respondent was asked to respond for one or more of the eight major habitat types within the region, and results were aggregated at the regional level. A full list of these survey results can be found in Appendix P.

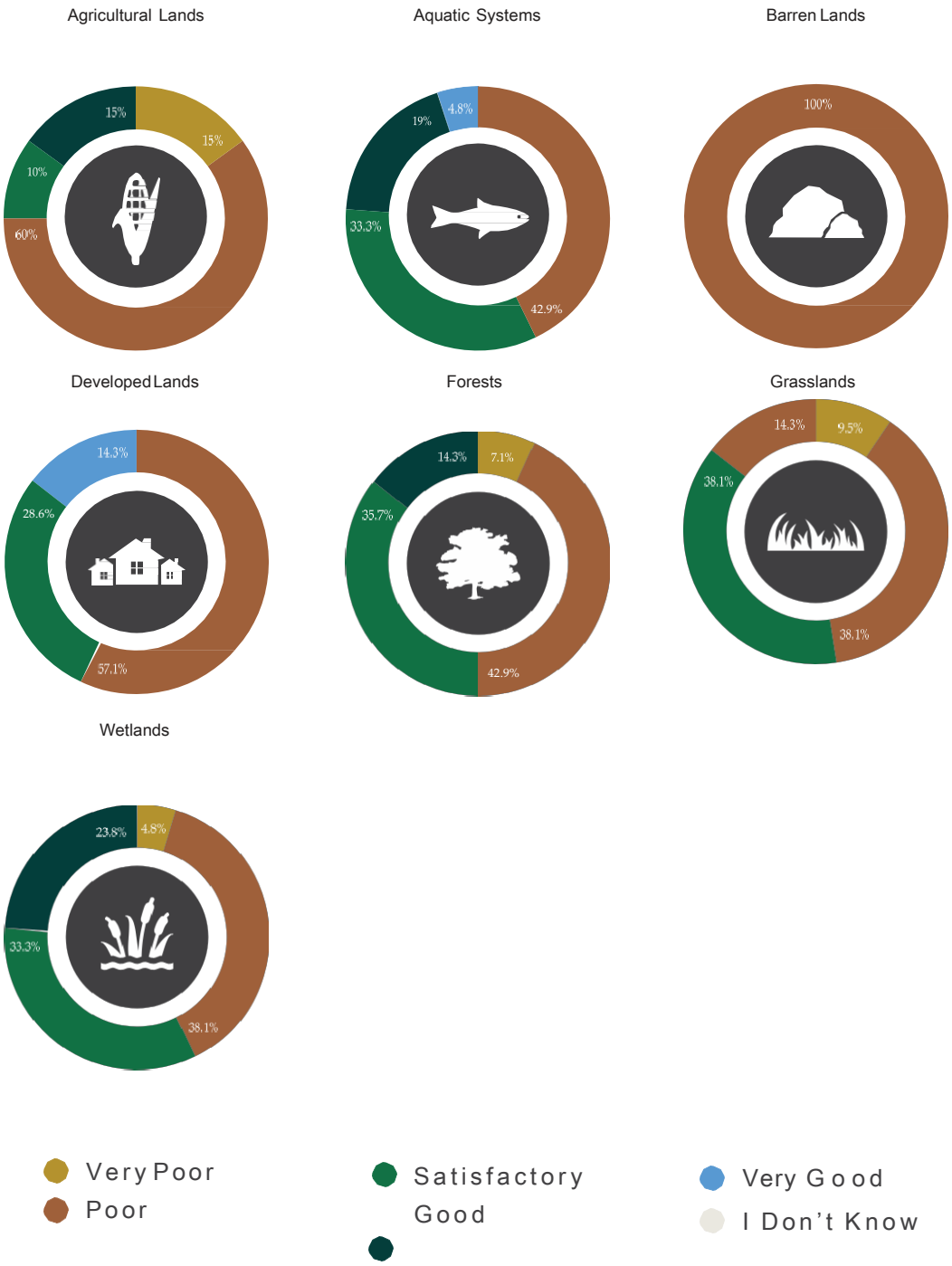


Figure 6-7. Overall quality of fish and wildlife habitats in the Kankakee Region in 2014.

Figure 6-8. Estimated change in the overall quality of fish and wildlife habitats from 2005 to 2014 for each of the major habitat types in the Kankakee Region.

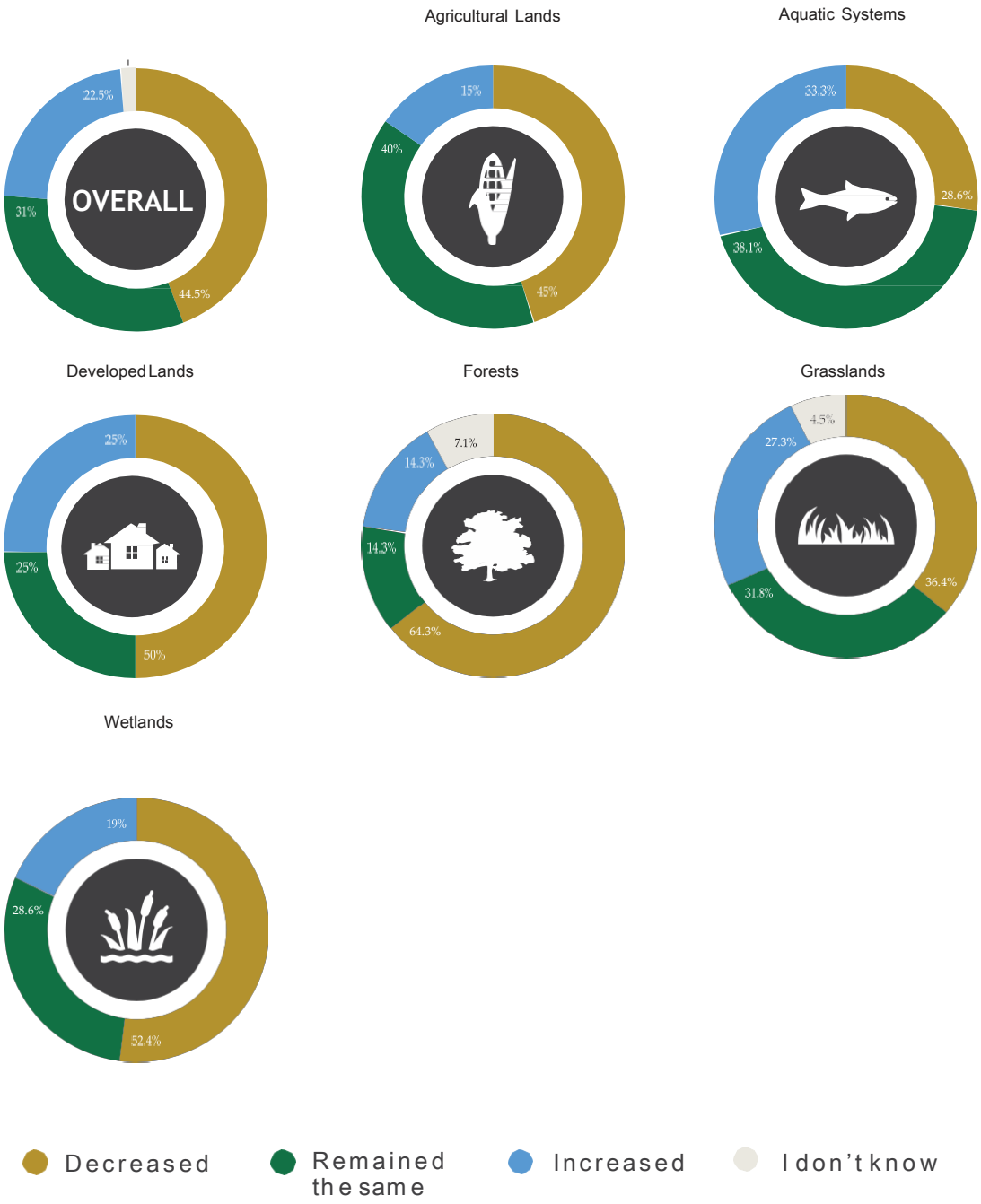
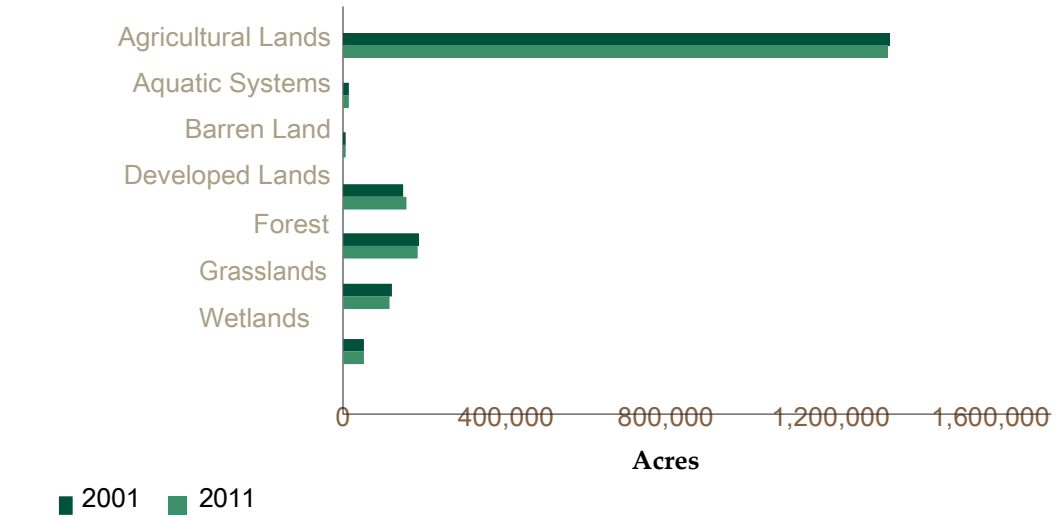


Figure 6-9. Predicted changes in overall quality of fish and wildlife habitats over the next ten years for each major habitat type in the Kankakee Region.

Changes in Land Cover

Most land cover in the Kankakee Region, 71.9%, consists of agricultural lands, 9.8% forests, 8.3% developed lands, and 6.3% grasslands (Fig. 6-10). Compared to other regions in Indiana, the Kankakee Region has the highest percentage of agricultural lands and the lowest percentage of aquatic systems.

Although aquatic systems and wetlands have increased marginally (Table 6-5), the Kankakee Region has experienced loss in many habitat types over the past ten years. Most habitats were lost to urban development, and agriculture lost most cover in terms of total acreage (Fig. 6-10). Percentage-wise, the greatest net losses were seen in grasslands (1.5%) and forests (0.7%). The greatest net increases were seen in barren lands (20.2%), developed lands (3.8%), and aquatic systems (2.6%).



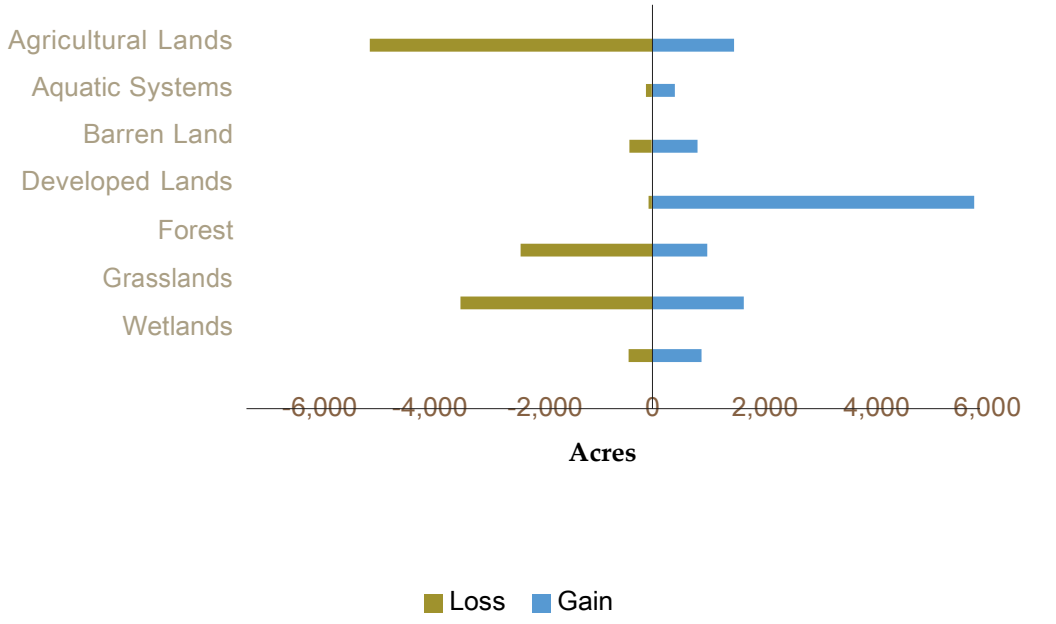


Figure 6-10. The distribution of land cover, and losses and gains in land cover in the Kankakee Region between 2001 and 2011 from NLCD.

Threats Affecting Habitats

Top Threat Categories

The third element requires the description of threats to SGCN and their habitats. The SWAP identifies a habitat perspective in order to manage for the conservation of species in Indiana. This section utilizes the same hierarchical method of identifying and rating threats based on Salafsky et al. (2008) that was outlined in Chapter V. Category rankings and specific threat rankings are outlined below (Table 6-5). A full summary of the Habitat Survey results can be found in Appendix P.

For first-level threat categories, agriculture and aquaculture, invasive and other problematic species and genes, residential and commercial development, natural system modification, and human intrusion and disturbance had mean threat level ratings between significant and moderate. Climate change and severe weather, pollution, other stressors, transportation and service corridors, biological resource use, and energy production and mining had average threat level ratings between moderate and minor. No threat category received an average rating landing between the minor and not a threat levels for the region.

Agriculture and aquaculture was identified as the top threat category across this region and within each of the major habitat types except for developed lands, forests, and grasslands. Invasive and other problematic species and genes were ranked first in forests and grasslands. Residential and commercial development was identified as the top threat to fish and wildlife habitats in developed lands.

Within agriculture and aquaculture, conversion of habitat to annual crops was identified as the top specific second-level threat for the region, followed closely by annual and perennial non-timber crops. Other specific threats in this category received lower average threat levels. Livestock farming and ranching was on average rated within the moderate and minor threat level. Both wood and pulp plantations as well as aquaculture received average ratings between minor and not a threat. Some respondents noted agricultural practices, such as use of insecticide and non-local genotype seeds, may be a threat in this region.

Invasive and other problematic species and genes were ranked highly as a threat to habitats in all land use types with the exception of developed lands. The invasive and alien species category was regionally rated as a significant to moderate threat, while the other specific threats within this category were on average rated as a moderate to minor threat. Respondents identified a concern for problematic native species like beavers and geese.

Development was identified as the highest rated threat to fish and wildlife habitats with developed lands, and a moderately high-ranking threat within other habitat types. Both housing and urban areas and commercial and industrial areas were rated on average as a significant to moderate threat to habitats in this land use type.

Natural systems modification was ranked as the fourth highest threat across the region, and received high to mid rankings in individual habitat types. Natural habitat conversion was ranked as the most specific threat within this category, receiving an average rating of significant to moderate threat regionally. All other threats in this category received a moderate to minor average rating in this region. As a category, human intrusion and disturbance ranked higher than climate change and severe weather, but specific threats within climate change and severe weather received average ratings from significant to moderate, while specific threats within human intrusion and disturbance were rated moderate to minor. Biological resource use and energy production and mining were identified as the lowest ranking threats regionally. These threats ranked low in each habitat type, with the exception of energy production and mining in barren lands. Respondents also identified direct stressors, such as lack of fish and wildlife habitat or alteration of habitat through channelization of streams for aquatic systems.

Table 6-5. Threat category ranking to habitats in the Kankakee Region. First-level threat categories are based on the hierarchical method of identifying threats outlined in Salafsky et al. (2008). Ranked threat categories for the entire region are arranged by each major habitat type (1 - highest threat).

Category	Regional Ranking	Aquatic Systems	Agricultural Lands	Barren Lands	Developed Lands	Forests	Grasslands	Wetlands
Agriculture and Aquaculture	1	1	1	2	3	1	1	1
Invasive and Other Problematic Species and Genes	2	4	3	1	1	2	3	2
Residential and Commercial Development	3	3	4	7	10	4	2	4
Natural Systems Modification	4	6	2	6	5	3	4	3
Human Intrusion and Disturbance	5	2	5	3	2	6	8	5
Climate Change and Severe Weather	6	5	7	4	4	5	5	7
Pollution	7	7	6	8	7	7	6	6
Other Stressors	8	8	8	5	6	9	7	8
Transportation and Service Corridors	9	9	9	9	8	8	9	9
Biological Resource Use	10	11	10	11	9	10	11	10
Energy Production and Mining	11	10	11	10	11	11	10	11

Top Specific Threats in Ranked Order

In the Habitat Survey, respondents were also asked to identify specific threats to major habitat types using the same threat category ranking system outlined in Salafsky et al. (2008). These second-level threats represent subcategories of threats within the major threat categories listed in the table above. The following are the top specific second-level threats to habitats in the Kankakee Region, aggregated across habitat types:

1. Invasive and alien species
2. Conversion of natural habitats to other land uses
3. Conversion of habitat to annual crops
4. Changing frequency, duration, and intensity of floods
5. Changing frequency, duration, and intensity of drought
6. Annual and perennial non-timber crops
7. Housing and urban areas
8. Agriculture, residential, and forestry effluents
9. Shifting and alteration of habitats due to climate change
10. Runoff from roads/service corridors

In the Species Survey, respondents were also asked to identify threats to individual SGCN using the same threat category ranking system. The following is the top specific (second-level) threat to SGCN occurring in the Kankakee Region, aggregated across all species:

1. Natural habitat conversion

Emerging/Anticipated Threats

In a free-response question, respondents were asked specifically to identify any emerging/anticipated threats over the next ten years for fish and wildlife habitats within the major habitat types for a region.

Respondents identified anticipated threats to fish and wildlife habitats tied to expansion of agriculture and loss of CRP grasslands. Other respondents also noted that habitats may be threatened by the increased spread of invasive species and lack of public valuation of wildlife habitats.

Conservation Actions Needed

Top Action Categories

The fourth element of the Congressional guidelines requires that the SWAP describe conservation actions proposed to conserve identified species and habitats as well as outlining priorities for their implementation. This section outlines conservation actions identified on a regional basis for each of the major habitat types following the same protocol to rate and rank actions in this region based on Salafsky et al. (2008) that was outlined in Chapter V. Category rankings for actions, and specific actions are in Table 6-6. A full summary of the Habitat

Survey results can be found in Appendix P.

All categories had average ratings between very and moderately important, indicating respondents observing a need for a variety of management actions within this region. Land, water, and species management was ranked as the most important category of actions regionally and in each individual land use type except for developed lands. Within the categories, means were used to determine the rankings. Because of this, some habitat-specific options with few respondents may have high means regionally. Overall, important actions reflected respondents identifying a need to restore habitats and disturbance regimes as well as control invasive species in multiple habitat types.

Reducing loss of habitat due to agricultural and residential development was identified as one of the highest rated actions across several habitat types; this action was ranked first in aquatic systems and forests. Developing farming technologies and practices also was rated as the most important conservation action for fish and wildlife habitats in agricultural lands and developed lands; this action was also ranked relatively highly among other habitat types as well.

Land and water protection was rated second overall for this region and tied for first with land, water, and species management in barren lands, developed lands, and grasslands. Respondents emphasized a need to acquire currently unprotected lands in various habitat types. Preserving currently existing corridors was ranked as either the first or second action of importance in every habitat type, except for barren lands, which had no respondents. In general, using easements to protect fish and wildlife habitats was also ranked highly across habitat types in this region.

Education and awareness as a category was ranked third overall, though three of the four categories received an average rating between very important to moderately important actions. Improvement of signage and communication materials was, on average, rated between moderately important and somewhat important. Respondents also noted an importance to increase public valuation of resources, particularly in grasslands and wetlands.

Law and policy was ranked fourth overall but second in forests. Increasing regulations on invasive species was identified as a very to moderately important action for forests. Respondents suggested changes in policy regarding drainage, log jam removal, and harvesting in this region. External capacity building and livelihood, economic, and other incentives were the two lowest ranked categories for this region, although strengthening conservation financing was identified as a very to moderately important action for fish and wildlife habitats across multiple land use types.

Table 6-6. Action category ranking to habitats in the Kankakee Region. First-level categories are based on the hierarchical method of identifying actions outlined in Salafsky et al. (2008). Ranked action categories for the entire region and are arranged by each major habitat type.

Category	Regional Ranking	Aquatic Systems	Agricultural Lands	Barren Lands	Developed Lands	Forests	Grasslands	Wetlands
Land/Water/Species Management	1	1	1	1	3	1	1	1
Land/Water Protection	2	2	2	1	1	3	1	2
Education and Awareness	3	3	3	1	1	5	3	3
Law and Policy	4	4	5	1	3	2	5	4
External Capacity Building	5	5	6	1	3	4	4	5
Livelihood, Economic, and Other Incentives	6	6	4	1	6	6	6	6
	Indicates a tie within this habitat type							

Top Specific Actions in Ranked Order

In the Habitat Survey, respondents were also asked to identify specific actions for major habitat types using the same action category ranking system outlined in Salafsky etal.(2008). These second-levelactions representsubcategoriesofactions within the major action categories listed in the table above. The following are the top specific second-level conservation actions for habitats in the Kankakee Region, aggregated across habitat types:

1. Preserve currently existingcorridors
2. Strengthen conservation financing
3. Reduce loss of fish and wildlife habitats (due to agriculture, urban sprawl, commercial development, etc.)
4. Acquire conservation easements to protect important wildlife habitats
5. Reduce conversion to cropland
6. Developalliances and partnerships (e.g., between producers, landowners, and conservation professionals)
7. Manage recreational opportunities to be compatible with fish and wildlife habitats
8. Develop and promote farming technologies and practices that have conservation benefits (e.g., cover crops, no-till, and soil health)
9. Promote nonmonetary values of natural systems within the state
10. Increase capacity for research and monitoring of conservation actions

The following are top actions for SGCN occurring the Kankakee Region, as summarized from the free-response questions about conservation actions for individual species:

1. Educate and engage with landowners and citizens.
2. Enhance connectivity of habitats
3. IncreaseCRPlands
4. Protect large contiguous forested areas
5. Limit conversion of habitat tonon-habitat
6. Reduce point and non-point source pollution
7. Protect and restore riparian corridors
8. Control invasive plants
9. Minimize disturbance to nesting birds
10. Use burning and mowing as management techniques
11. Protect and manage large wetland complexes

Prioritization of Actions

In order to prioritize these actions within an environment of limited resources, respondents were then asked to distribute hypothetical "effort points" to any action they had previously rated as "very important" for any of the major habitat types within a region. The effort ratings were averaged and then ranked to identify the top five actions for a region.

Full survey results are summarized in Appendix P. Priority actions for this region include the following:

1. Reduce conversion to cropland
2. Acquire conservation easements to protect important wildlife habitats
3. Acquire currently unprotected wetlands
4. Preserve currently existing corridors
5. Develop educational programs in general

The top priority actions reflect an identification of agriculture and aquaculture as a significant threat to fish and wildlife habitats in this region. Education-focused actions and land and water protection actions, such as acquiring easements and unprotected habitats as well as preserving corridors, received a greater amount of hypothetical effort over many of the highly rated land, water, and management actions in each land use type.

Threats and Actions by Major Habitat Type

The following summaries break down threats and conservation actions in this region by major habitat type, based on responses to the Habitat Survey and the Species Survey. For each major habitat type in this region, the SGCN that occur there, top threats to SGCN, top actions for SGCN, key threats to habitats, and priority actions for habitats are listed.

Threats and actions were only included in these lists if the majority of eligible survey respondents, greater than 50%, rated them, to avoid artificially elevating items which were highly ranked, but only by a few respondents. This approach left some threat/action lists with no items for certain habitats, which is illogical from a practical perspective. Therefore, in these situations, the top threats/actions are still listed but are denoted with an asterisk (*) to signify that there may be some items, which seem out-of-place, reflecting a lack of sufficient response for a particular habitat in the survey.

For each list, approximately ten items are given. Lists may be shorter if fewer than ten items were rated by a majority of survey respondents or longer if there were ties between items (e.g. they have exactly the same mean score and exactly the same number of respondents who rated them).

Top actions for SGCN were summarized from free-response questions about individual species and, therefore, do not follow the same categorizations as actions for habitats. The full text of all survey responses can be found in Appendix P.

Agricultural Lands

Agricultural lands are defined as lands devoted to commodity production. Examples of agricultural lands include: intensively managed non-native grasses, row crops, fruit and nut-bearing trees, confined feeding operations, and feedlots.

Top threats to SGCN occurring in agricultural lands in the Kankakee Region:

1. Natural habitat conversion
2. Conversion of habitat to annual crops
3. Annual and perennial non-timber crops
4. Fire and fire suppression
5. Over-mowing of natural areas
6. Dams and water management and use
7. Livestock farming and ranching

Top conservation actions for SGCN occurring in agricultural lands in the Kankakee Region:

1. Increase and maintain CRP lands
2. Establish conservation easements on farmland surrounding protected areas
3. Educate agricultural landowner community
4. Provide incentives to farmers to increase participation in conservation
5. Maintain shallow-water areas for shorebirds
6. Preserve suitable nest sites for Barn Owls
7. Encourage no-till practices

Top threats to fish and wildlife habitats in agricultural lands in the Kankakee Region:

1. Conversion of natural habitats to other land uses
2. Conversion of habitat to annual crops
3. Invasive and alien species
4. Annual and perennial non-timber crops
5. Over-mowing of natural areas
6. Housing and urban areas
7. Runoff from roads and service corridors
8. Dams and water management and use
9. Commercial and industrial areas
10. Point source pollution from commercial and industrial sources
11. Agriculture, residential, and forestry effluents

Top conservation actions for fish and wildlife habitats in agricultural lands in the Kankakee Region:

1. Acquire conservation easements to protect important wildlife habitats
2. Preserve currently existing corridors
3. Develop and promote farming technologies and practices that have conservation benefits (e.g., cover crops, no-till, and soil health)
4. Link existing habitat blocks through corridor enhancement in agricultural lands
5. Reduce conversion to cropland
6. Reduce loss of fish and wildlife habitats (due to agriculture, urban sprawl, commercial development, etc.)
7. Strengthen conservation financing
8. Promote nonmonetary values of natural systems within the state
9. Manage recreational opportunities to be compatible with fish and wildlife habitats

Aquatic Systems

Aquatic systems are defined as all water habitats, both flowing and stationary. Examples of aquatic systems include: manmade impoundments, natural lakes rivers, streams, oxbows, sloughs, embayments, and backwaters (not including wetlands).

Top threats to SGCN occurring in aquatic systems in the Kankakee Region:

1. Natural habitat conversion
2. Conversion of habitat to annual crops
3. Annual and perennial non-timber crops
4. Dams and water management and use

Top conservation actions for SGCN occurring in aquatic systems in the Kankakee Region:

1. Improve water quality
2. Protect aquatic systems
3. Restore and protect riparian corridors
4. Clean polluted areas
5. Reduce point and non-point source pollution
6. Implement agricultural BMPs
7. Manage water levels in rivers and lakes
8. Preserve nest sites for Ospreys and Bald Eagles
9. Maintain bottomland floodplain habitat
10. Restrict recreational overuse on rivers
11. Protect habitat from dredging
12. Remove dams
13. Reduce siltation and nutrient inputs
14. Maintain and increase flows and flow volumes

Top threats to fish and wildlife habitats in aquatic systems in the Kankakee Region:

1. Agriculture, residential, and forestry effluents
2. Invasive and alien species
3. Conversion of natural habitats to other land uses
4. Changing frequency, duration, and intensity of floods
5. Annual and perennial non-timber crops
6. Changing frequency, duration, and intensity of drought
7. Runoff from roads and service corridors
8. Conversion of habitat to annual crops
9. Point source pollution from commercial and industrial sources
10. Commercial and industrial areas

Top conservation actions for fish and wildlife habitats in aquatic systems in the Kankakee Region:

1. Preserve currently existing corridors
2. Acquire conservation easements to protect important wildlife habitats
3. Promote use of research and science in conservation decision-making processes
4. Reduce loss of fish and wildlife habitats (due to agriculture, urban sprawl, commercial development, etc.)
5. Acquire currently unprotected aquatic systems (manage and/or educate for easement habitat values)
6. Reduce nutrient and toxin loads (e.g., heavy metals, pharmaceuticals, fertilizers, insecticides)
7. Develop education programs in general
8. Strengthen conservation financing
9. Develop and promote farming technologies and practices that have conservation benefits (e.g., cover crops, no-till, and soil health)
10. Increase state's capacity for research and monitoring of conservation actions

Barren Lands

Barren lands are defined as lands dominated by exposed rock or minerals with sparse vegetation. Examples of barren lands include: sand/dunes, rock outcrops, cliffs, and bare rock.

Top threats to SGCN occurring in barren lands in the Kankakee Region:

1. Natural habitat conversion
2. Annual and perennial non-timber crops
3. Conversion of habitat to annual crops
4. Dams and water management and use
5. Over-mowing of natural areas
6. Fire and fire suppression

Top conservation actions for SGCN occurring in barren lands in the Kankakee Region:

1. Educate public about Peregrine Falcon
2. Protect Bald Eagle nest sites

Top threats to fish and wildlife habitats in barren lands in the Kankakee Region:

1. Invasive and alien species
2. Problematic native species (e.g., overabundant native deer or algae)
3. Plant diseases
4. Introduced genetic material (such as crop, seed stock, bio-control, stocked/released species,etc.)
5. Chemical spills
6. Point source pollution from commercial/industrial sources
7. Air pollution (e.g., smoke, mercury emissions)
8. Household sewage and urban water waste
9. Garbage and solid waste
10. Excess energy (e.g., noise/light pollution, warm water discharge, etc.)

Top conservation actions for fish and wildlife habitats in barren lands in the Kankakee Region:

- *No survey responses were received for actions in this habitat type in this region*

Developed Lands

Developed lands are defined as highly impacted lands intensively modified to support human habitation, transportation, commerce, and recreation. Examples of developed lands include: urban lands, suburban lands, industrial areas, commercial areas, towers for communication and wind power generation, and recreational areas such as golf courses and soccer fields.

Top threats to SGCN occurring in developed lands in the Kankakee Region:

1. Renewable energy production
2. Diseases from domestic populations and unknown sources
3. Fossil fuel energy production
4. Mining and quarrying

Top conservation actions for SGCN occurring in developed lands in the Kankakee Region:

1. Enhance public education and awareness regarding bat ecology and issues
2. Reduce urban sprawl and commercial property expansion
3. Manage urban areas for Peregrine Falcons; minimize disturbance during nesting
4. Increase gravel-surfaced rooftop habitat for breeding Common Nighthawks
5. Mitigate road hazards for wildlife

Top threats to fish and wildlife habitats in developed lands in the Kankakee Region:

1. Runoff from roads and service corridors
2. Housing and urban areas
3. Commercial and industrial areas
4. Changing frequency, duration, and intensity of drought
5. Invasive and alien species
6. Point source pollution from commercial and industrial sources
7. Air pollution (e.g., smoke, mercury emissions)
8. Excess energy (e.g., noise and light pollution, warm water discharge, etc.)
9. Changing frequency, duration, and intensity of floods
10. Roads and railroads
11. Conversion of natural habitats to other land uses

Top conservation actions for fish and wildlife habitats in developed lands in the Kankakee Region:

1. Preserve currently existing corridors
2. Acquire conservation easements to protect important wildlife habitats
3. Establish training programs for stakeholders
4. Promote nonmonetary values of natural systems within the state
5. Manage recreational opportunities to be compatible with fish and wildlife habitats
6. Develop alliances and partnerships (e.g., between producers, landowners, and conservation professionals)
7. Promote use of research and science in conservation decision-making processes
8. Develop education programs in general

Forests

Forests are defined as a plant community dominated by trees. Examples of forests include, but are not limited to, all stages of natural forest and plantations.

Top threats to SGCN occurring in forests in the Kankakee Region:

1. Natural habitat conversion
2. Shifting and alteration of habitats
3. Conversion of habitat to annual crops
4. Housing and urban areas
5. Annual and perennial non-timber crops
6. Commercial and industrial areas
7. Invasive and alien species
8. Diseases from domestic populations and unknown sources
9. Fire and fire suppression
10. Wood and pulp plantations
11. Tourism and recreation areas
12. Over-mowing of natural areas
13. Livestock farming and ranching
14. Recreation activities
15. Problematic native species

Top conservation actions for SGCN occurring in forests in the Kankakee Region:

1. Protect large contiguous forested areas and reduce forest fragmentation
2. Limit conversion of forests to non-forest land uses
3. Control invasive woody plants to benefit Box Turtles, Whip-poor-wills, and other species
4. Reduce development in forested areas to benefit warblers and other species
5. Protect roost trees for bat species
6. Restore forests and woodlands (benefits all forest species)
7. Create small forest openings to increase diversity
8. Provide downed woody debris for the Least Weasel
9. Implement best management practices in forestry

Top threats to fish and wildlife habitats in forests in the Kankakee Region:

1. Invasive and alien species
2. Conversion of natural habitats to other land uses
3. Conversion of habitat to annual crops
4. Annual and perennial non-timber crops
5. Roads and railroads
6. Housing and urban areas
7. Problematic native species
8. Fire and fire suppression
9. Recreation activities (e.g., ATVs, trail use, horseback riding, high-speed boating, canoeing)
10. Utility and service lines

Top conservation actions for fish and wildlife habitats in forests in the Kankakee Region:

1. Control invasive species in forests
2. Reduce loss of fish and wildlife habitats (due to agriculture, urban sprawl, commercial development, etc.)
3. Reduce conversion to cropland
4. Increase regulations on invasive species
5. Manage recreational opportunities to be compatible with fish and wildlife habitats
6. Preserve currently existing corridors
7. Strengthen conservation financing
8. Acquire currently unprotected forests
9. Restore habitats and natural systems in forests
10. Develop alliances and partnerships (e.g., between producers, landowners, and conservation professionals)
11. Increase state's capacity for research and monitoring of conservation actions

Grasslands

Grasslands are defined as an open area dominated by grass species. Examples of grasslands include: haylands, pasture, prairies, savannahs, or reclaimed mine lands.

Top threats to SGCN occurring in grasslands in the Kankakee Region:

1. Conversion of habitat to annual crops
2. Annual and perennial non-timber crops
3. Livestock farming and ranching

Top conservation actions for SGCN occurring in grasslands in the Kankakee Region:

1. Restore and improve connectivity of grasslands (benefits all grassland species)
2. Reduce woody encroachment on grasslands to benefit the Massasauga, Sedge Wren, and other species
3. Increase CRP grasslands (benefits all grassland species)
4. Implement burning regimes (but plan around active seasons, such as when the Smooth Greensnake is active)
5. Minimize disturbance to nesting grassland birds (e.g., Henslow's Sparrow)
6. Mow properly (reduce mowing for shorebirds and owls)
7. Improve grazing practices
8. Establish translocation program for Franklin's Ground Squirrels

Top threats to fish and wildlife habitats in grasslands in the Kankakee Region:

1. Invasive and alien species
2. Conversion of habitat to annual crops
3. Conversion of natural habitats to other land uses
4. Annual and perennial non-timber crops
5. Housing and urban areas
6. Fire and fire suppression
7. Roads and railroads
8. Commercial and industrial areas
9. Over-mowing of natural areas
10. Introduced genetic material (such as crop, seed stock, bio-control, stocked/released species, etc.)

Top conservation actions for fish and wildlife habitats in grasslands in the Kankakee Region:

1. Restore habitats and natural systems in grasslands
2. Acquire currently unprotected grasslands
3. Preserve currently existing corridors
4. Re-establish natural disturbance regimes in grasslands
5. Reduce loss of fish and wildlife habitats (due to agriculture, urban sprawl, commercial development, etc.)
6. Reduce conversion to cropland
7. Control invasive species in grasslands
8. Promote diversity of grassland types and successional stages
9. Acquire conservation easements to protect important wildlife habitats
10. Promote conservation payment programs (e.g., payment for ecosystem services, conservation easements)
11. Promote nonmonetary values of natural systems within the state

Wetlands

Wetlands are defined as either ephemeral or permanently flooded habitat. Examples of wetlands include: swamps, marshes, bogs, fens, potholes, wetlands of farmed areas, and mudflats.

Top threats to SGCN occurring in wetlands in the Kankakee Region:

1. Natural habitat conversion
2. Invasive and alien species
3. Conversion of habitat to annual crops
4. Housing and urban areas
5. Commercial and industrial areas
6. Annual and perennial non-timber crops
7. Tourism and recreation areas
8. Problematic native species
9. Dams and water management and use
10. Recreation activities
11. Fire and fire suppression
12. Over-mowing of natural areas

Top conservation actions for SGCN occurring in wetlands in the Kankakee Region:

1. Protect and maintain large wetlands complexes
2. Restore wetlands
3. Protect buffers around wetlands
4. Control invasive plants in wetlands
5. Create shorebird management areas
6. In some cases, actively manage water levels (e.g., for Black Tern, Common Gallinule)
7. Mitigate road hazards to amphibians and reptiles when roads cross over wetlands
8. Minimize disturbance to nesting turtles
9. Provide stopover and roosting habitat for cranes

Top threats to fish and wildlife habitats in wetlands in the Kankakee Region:

1. Invasive and alien species
2. Conversion of natural habitats to other land uses
3. Changing frequency, duration, and intensity of drought
4. Changing frequency, duration, and intensity of floods
5. Housing and urban areas
6. Conversion of habitat to annual crops
7. Commercial and industrial areas
8. Runoff from roads and service corridors
9. Agriculture, residential, and forestry effluents
10. Shifting and alteration of habitats due to climate change

Top conservation actions for fish and wildlife habitats in wetlands in the Kankakee Region:

1. Acquire currently unprotected wetlands
2. Strengthen conservation financing
3. Restore habitats and natural systems in wetlands
4. Preserve currently existing corridors
5. Control invasive species in wetlands
6. Reduce loss of fish and wildlife habitats (due to agriculture, urban sprawl, commercial development, etc.)
7. Promote conservation payment programs (e.g., payment for ecosystem services, conservation easements)
8. Manage recreational opportunities to be compatible with fish and wildlife habitats
9. Develop alliances and partnerships (e.g., between producers, landowners, and conservation professionals)
10. Develop and promote farming technologies and practices that have conservation benefits (e.g., cover crops, no-till, and soil health)

C. CORN BELT REGION

Figure 6-11. Outline of the Corn Belt Region in Indiana for the SWAP.

Introduction

This section summarizes habitat conditions, threats to SGCN and their habitats, and conservation actions for species and habitats in the Corn Belt Region. This section also reviews land cover changes over the past decade and identifies unique habitat types in this region. Summaries of threats to and conservation actions for SGCN and their habitats that were generated from two surveys can be found at the end of this section.

In addition to the threats and actions identified in the Habitat Survey and the Species Survey, the DFW recognized the need to identify threats aligned with specific actions. Several threats and actions were identified as ubiquitous across all sixregions. These include:

- **Habitat Loss:** Develop and promote farming technologies and practices that have conservation benefits (e.g., cover crops, no-till, and soilhealth)
- **Invasive Species:** Build external capacity (form and facilitate partnerships, alliances, and networks of organizations to address invasive species)
- **Law and Policy:** Develop, change, influence and help implement formal legislation, regulations and voluntary standards
- **Dams and Water Management and Use:** Remove unnecessary dams and utilize necessary dams with effective fish passage structures

The DFW also identified specific threats and actions for each SWAP region based on DFW priorities. These threats were identified due to their high level of relevancy to the specific region and the workability of the associated actions. These threats and actions for the Corn Belt Region include:

- **Habitat Fragmentation:** Preserve and restore habitat corridors
- **Natural System Modifications (Residential/Commercial Development):** Build external capacity by forming partnerships and networks, raising and providing funds, and resources to develop conservation-minded urban planning

Current Habitat Conditions

During the Species Survey, respondents were asked to identify SGCN within the Corn Belt Region. A full summary of the Species Survey results can be found in Appendix O.

Table 6-7. Distribution of SGCN across the Corn Belt Region.

Taxa	Scientific Name	Common Name
Amphibians	*Necturus maculosus*	Common Mudpuppy
Amphibians	*Ambystoma laterale*	Blue-spotted Salamander
Amphibians	*Hemidactylium scutatum*	Four-toed Salamander
Amphibians	*Acris blanchardi*	Blanchard's Cricket Frog
Amphibians	*Lithobates blairi*	Plains Leopard Frog
Birds	*Cygnus buccinator*	Trumpeter Swan
Birds	*Colinus virginianus*	Northern Bobwhite
Birds	*Chordeiles minor*	Common Nighthawk
Birds	*Antrostomus vociferus*	Eastern Whip-poor-will
Birds	*Laterallus jamaicensis*	Black Rail
Birds	*Rallus elegans*	King Rail
Birds	*Rallus limicola*	Virginia Rail
Birds	*Gallinula galeata*	Common Gallinule
Birds	*Grus canadensis*	Sandhill Crane
Birds	*Grus americana*	Whooping Crane
Birds	*Pluvialis dominica*	American Golden-plover
Birds	*Charadrius melodus*	Piping Plover
Birds	*Bartramia longicauda*	Upland Sandpiper
Birds	*Arenaria interpres*	Ruddy Turnstone
Birds	*Calidris subruficollis*	Buff-breasted Sandpiper
Birds	*Limnodromus griseus*	Short-billed Dowitcher
Birds	*Scolopax minor*	American Woodcock
Birds	*Tringa solitaria*	Solitary Sandpiper
Birds	*Tringa melanoleuca*	Greater Yellowlegs
Birds	*Phalaropus tricolor*	Wilson's Phalarope
Birds	*Sternula antillarum athalassos*	Interior Least Tern
Birds	*Chlidonias niger*	Black Tern
Birds	*Botaurus lentiginosus*	American Bittern
Birds	*Ixobrychus exilis*	Least Bittern
Birds	*Ardea alba*	Great Egret
Birds	*Nycticorax nycticorax*	Black-crowned Night-heron

Taxa	Scientific Name	Common Name
Birds	*Nyctanassa violacea*	Yellow-crowned Night-heron
Birds	*Pandion haliaetus*	Osprey
Birds	*Ictinia mississippiensis*	Mississippi Kite
Birds	*Haliaeetus leucocephalus*	Bald Eagle
Birds	*Circus cyaneus*	Northern Harrier
Birds	*Accipiter striatus*	Sharp-shinned Hawk
Birds	*Buteo platypterus*	Broad-winged Hawk
Birds	*Tyto alba*	Barn Owl
Birds	*Asio flammeus*	Short-eared Owl
Birds	*Falco peregrinus*	Peregrine Falcon
Birds	*Lanius ludovicianus*	Loggerhead Shrike
Birds	*Cistothorus platensis*	Sedge Wren
Birds	*Cistothorus palustris*	Marsh Wren
Birds	*Ammodramus henslowii*	Henslow's Sparrow
Birds	*Xanthocephalus xanthocephalus*	Yellow-headed Blackbird
Birds	*Sturnella neglecta*	Western Meadowlark
Birds	*Helmitheros vermivorum*	Worm-eating Warbler
Birds	*Vermivora chrysoptera*	Golden-winged Warbler
Birds	*Mniotilta varia*	Black-and-white Warbler
Birds	*Setophaga citrina*	Hooded Warbler
Birds	*Setophaga kirtlandii*	Kirtland's Warbler
Birds	*Setophaga cerulea*	Cerulean Warbler
Fish	*Ichthyomyzon fossor*	Northern Brook Lamprey
Fish	*Anguilla rostrata*	American Eel
Fish	*Clinostomus elongatus*	Redside Dace
Fish	*Coregonus artedi*	Cisco
Fish	*Moxostoma valenciennesi*	Greater Redhorse
Fish	*Percina evides*	Gilt Darter
Fish	*Etheostoma maculatum*	Spotted Darter
Mammals	*Condylura cristata*	Star-nosed Mole
Mammals	*Myotis lucifugus*	Little Brown Myotis
Mammals	*Myotis septentrionalis*	Northern Long-eared Myotis
Mammals	*Myotis sodalis*	Indiana Myotis
Mammals	*Lasionycteris noctivagans*	Silver-haired Bat
Mammals	*Perimyotis subflavus*	Tri-colored Bat
Mammals	*Nycticeius humeralis*	Evening Bat
Mammals	*Lasiurus borealis*	Eastern Red Bat
Mammals	*Lasiurus cinereus*	Hoary Bat
Mammals	*Spermophilus franklinii*	Franklin's Ground Squirrel
Mammals	*Geomys bursarius*	Plains Pocket Gopher
Mammals	*Mustela nivalis*	Least Weasel
Mammals	*Taxidea taxus*	American Badger

Taxa	Scientific Name	Common Name
Mollusks	*Cyprogenia stegaria*	Fanshell
Mollusks	*Epioblasma torulosa rangiana*	Northern Riffleshell
Mollusks	*Epioblasma triquetra*	Snuffbox
Mollusks	*Lampsilis fasciola*	Wavyrayed Lampmussel
Mollusks	*Obovaria subrotunda*	Round Hickorynut
Mollusks	*Plethobasus cyphyus*	Sheepnose
Mollusks	*Pleurobema clava*	Clubshell
Mollusks	*Ptychobranchus fasciolaris*	Kidneyshell
Mollusks	*Quadrula cylindrica cylindrica*	Rabbitsfoot
Mollusks	*Simpsonaias ambigua*	Salamander Mussel
Mollusks	*Toxolasma lividum*	Purple Lilliput
Mollusks	*Villosa fabalis*	Rayed Bean
Mollusks	*Villosa lienosa*	Little Spectaclecase
Mollusks	*Campeloma decisum*	Pointed Campeloma
Mollusks	*Lymnaea stagnalis*	Swamp Lymnaea
Reptiles	*Clemmys guttata*	Spotted Turtle
Reptiles	*Emydoidea blandingii*	Blanding's Turtle
Reptiles	*Terrapene carolina*	Eastern Box Turtle
Reptiles	*Terrapene ornata*	Ornate Box Turtle
Reptiles	*Pseudemys concinna*	River Cooter
Reptiles	*Thamnophis butleri*	Butler's Gartersnake
Reptiles	*Thamnophis proximus*	Western Ribbonsnake
Reptiles	*Nerodia erythrogaster neglecta*	Copper-bellied Watersnake
Reptiles	*Clonophis kirtlandii*	Kirtland's Snake
Reptiles	*Opheodrys aestivus*	Rough Greensnake
Reptiles	*Opheodrys vernalis*	Smooth Greensnake
Reptiles	*Cemophora coccinea*	Scarletsnake
Reptiles	*Tantilla coronata*	Southeastern Crowned Snake
Reptiles	*Farancia abacura*	Red-bellied Mudsnake
Reptiles	*Agkistrodon piscivorus*	Cottonmouth
Reptiles	*Sistrurus catenatus*	Eastern Massasauga
Reptiles	*Crotalus horridus*	Timber Rattlesnake

During the Habitat Survey, respondents were asked to evaluate the overall quality of fish and wildlife habitats in the Corn Belt Region (Fig. 6-12), estimate changes in overall quality since 2005 (Fig. 6-13), and predict changes in overall quality over the next ten years (Fig. 6-14). Each respondent was asked to respond for one or more of the eight major habitat types within the region, and results were aggregated at the regional level. A full list of these survey results can be found in Appendix P.

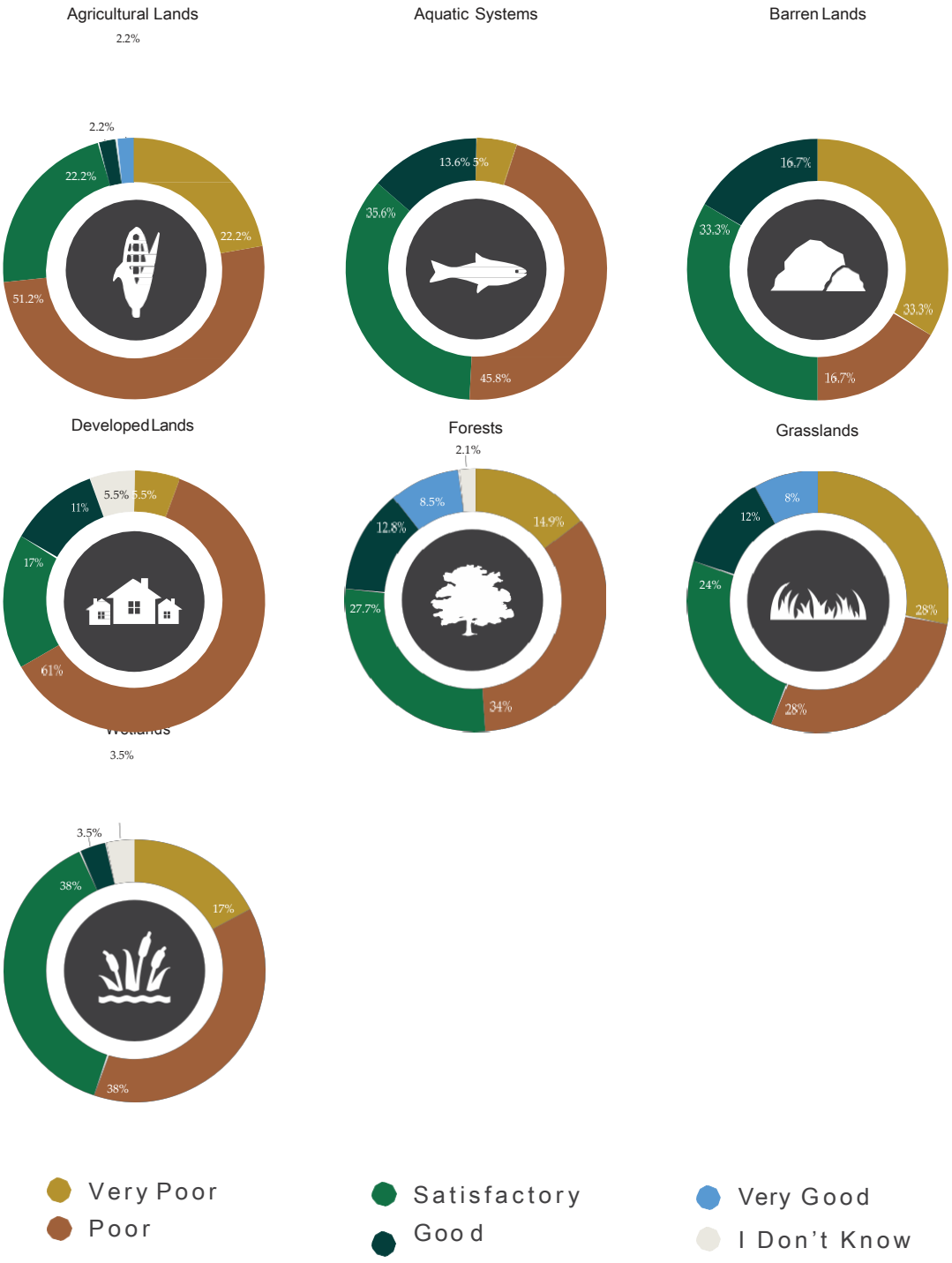


Figure 6-12. Overall quality of fish and wildlife habitats in the Corn Belt Region in 2014.

Figure 6-13. Estimated change in the overall quality of fish and wildlife habitats from 2005 to 2014 for each of the major habitat types in the Corn Belt Region.

Figure 6-14. Predicted changes in overall quality of fish and wildlife habitats over the next ten years for each major habitat type in the Corn Belt Region.

Changes in Land Cover

Most land cover in the Corn Belt Region, 71.6%, consists of agricultural lands, followed by 12% developed lands, 9.6% forests, and 5.3% grasslands (Fig. 6-15). Compared to other regions, the Corn Belt Region has a high percentage of agricultural and developed lands, and a low percentage of wetlands and barren lands.

Although the aquatic systems and wetlands increased marginally (Table 6-8), the Corn Belt Region has experienced loss in many habitat types over the past ten years. Most habitats were lost to urban development, and agriculture lost the most cover in terms of total acreage (Fig. 6-15). Percentage-wise, the greatest net losses were seen in grasslands (0.9%), agricultural lands (0.7%), and forests (0.6%). The greatest net increases were seen in barren lands (29.2%), developed lands (4.8%), and aquatic systems (2.9%).

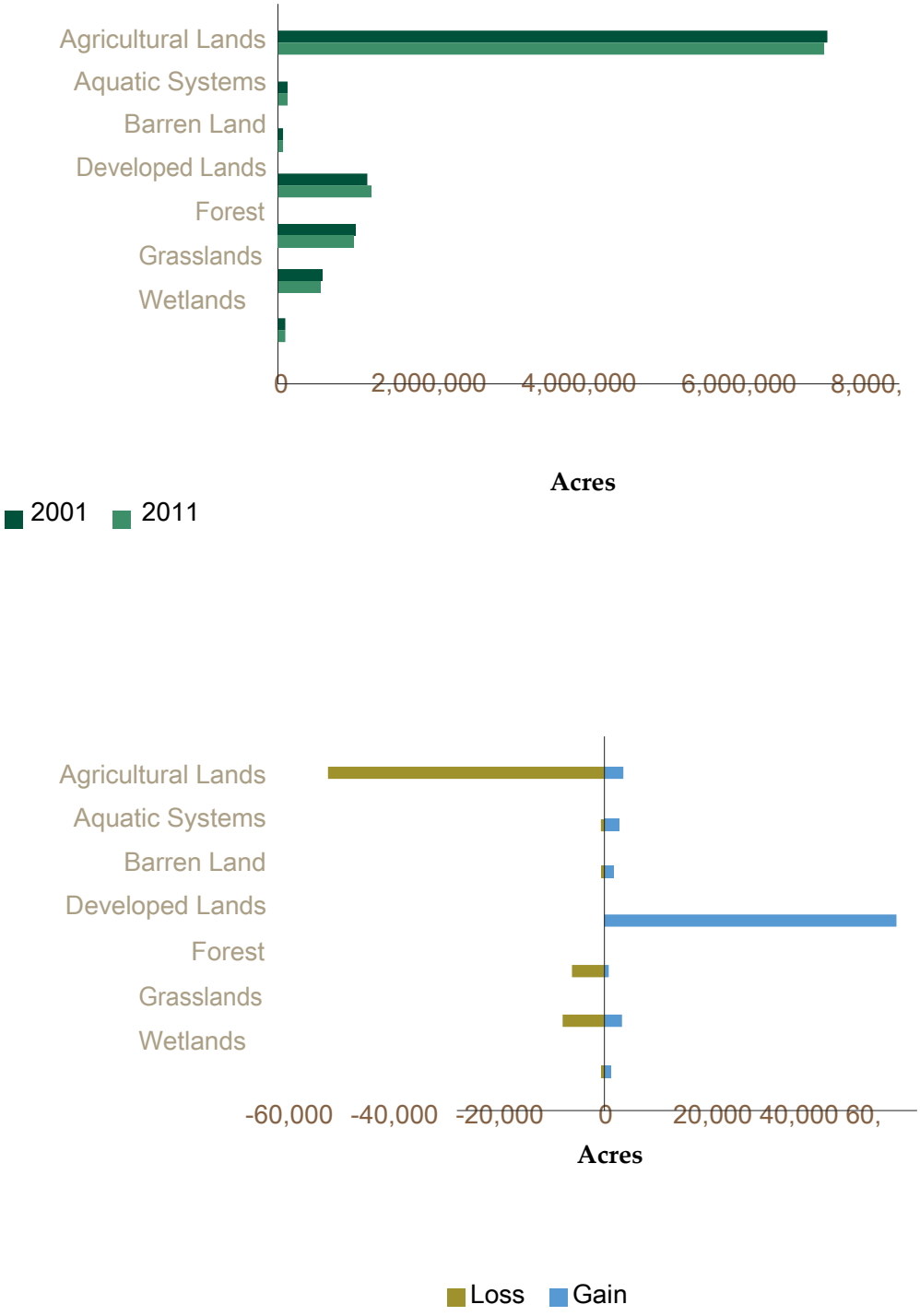


Figure 6-15. Distribution of land cover and losses and gains in land cover in the Corn Belt Region between 2001 and 2011 from NLCD.

Threats Affecting Habitats

Top Threat Categories

The third element requires the description of threats to SGCN and their habitats. This SWAP identifies a habitat perspective in order to manage for the conservation of species in Indiana. This section utilizes the same hierarchical method of identifying and rating threats based on Salafsky et al. (2008) that was outlined in Chapter V. Category rankings and specific threat rankings for habitats in this region are outlined below (Table 6-8). A full summary of the Habitat Survey results for the Corn Belt Region can be found in Appendix P.

First-level threat categories in this region received an average rating of above moderate to minor threat. Agriculture and aquaculture, invasive and other problematic species and genes, residential and commercial development, natural systems modification, and pollution received mean ratings from significant to moderate threat levels. Human intrusion and disturbance, other stressors, climate change and severe weather, transportation and service corridors, energy production and mining, and biological resource use received category ratings between moderate to minor threat level. No threat category received an average rating in the minor threat to not a threat for this region.

Agriculture and aquaculture were ranked first when aggregated regionally. Within agriculture and aquaculture, conversion of habitat and annual and perennial non-timber crops were, on average, rated as significant to moderately specific second-level threats. Aquaculture and wood and pulp plantations rated in the minor to no threat level in this region. Invasive and other problematic species and genes were also highly rated as a category across the region and ranked first in barren lands and forests. Invasive and alien species were the highest ranked specific threat across land types within this category. Residential and commercial development was ranked first in developed lands; both housing and urban areas and commercial and industrial areas were, on average, rated in the significant to moderately specific threat level for fish and wildlife habitats within this land type.

Natural systems modification was mid-ranked regionally but was ranked first within wetlands specifically. Conversion of habitat was identified as a significant to moderately specific threat to fish and wildlife habitats within wetlands. Dams and water management and use was also, on average, rated as a significant to moderately specific threat to fish and wildlife habitats in wetlands specifically, while it was rated as moderate to minor or minor to no threat in other land types.

Table 6-8. This table shows threat category rankings to habitats in the Corn Belt Region. First-level threats are based on the hierarchical method of identifying threats outlined in Salafsky et al. (2008). Ranked threat categories for the entire region are arranged by major habitat type (1 - highest threat).

Category	Regional Ranking	Aquatic Systems	Agricultural Lands	Barren Lands	Developed Lands	Forests	Grasslands	Wetlands
Agriculture and Aquaculture	1	1	1	3	9	2	1	3
Invasive and Other Problematic Species and Genes	2	3	2	1	5	1	3	2
Residential and Commercial Development	3	4	3	5	1	3	4	5
Natural Systems Modification	4	5	5	7	4	5	2	1
Pollution	5	2	4	6	2	7	7	4
Human Intrusion and Disturbance	6	6	7	2	3	4	5	7
Other Stressors	7	8	6	4	8	6	8	6
Climate Change and Severe Weather	8	7	8	8	7	9	6	8
Transportation and Service Corridors	9	9	9	10	6	8	9	9
Energy Production and Mining	10	11	10	9	10	11	10	11
Biological Resource Use	11	10	11	11	11	10	11	10

Top Specific Threats in Ranked Order

In the Habitat Survey, respondents were asked to identify specific threats to major habitat types using the same threat category ranking system outlined in Salafsky et al. (2008). These second-level threats represent subcategories of threats within the major threat categories listed in the table above. The following are the top specific second-level threats to habitats in the Corn Belt Region, aggregated across habitat types:

1. Invasive and alien species
2. Conversion of natural habitats to other land uses
3. Conversion of habitat to annual crops
4. Housing and urban areas
5. Agriculture, residential, and forestry effluents
6. Runoff from roads and service corridors
7. Commercial and industrial areas
8. Annual and perennial non-timber crops
9. Point source pollution from commercial/industrial sources
10. Household sewage and urban water waste

In the Species Survey, respondents were asked to identify threats to individual SGCN using the same threat category ranking system. The following are the top specific second-level threats to SGCN occurring in the Corn Belt Region, aggregated across all species:

1. Natural habitat conversion
2. Conversion of habitat to annual crops
3. Annual and perennial non-timber crops
4. Livestock farming and ranching
5. Dams and water management and use
6. Over-mowing of natural areas

Emerging/Anticipated Threats

In a free-response question, respondents were asked specifically to identify any emerging or anticipated threats over the next ten years for fish and wildlife habitats within the major habitat types for a region. A brief summary of the responses includes:

- A loss of forest cover was occurring in this region
- Some respondents identified specific subhabitat types, such as the Savanna Woodlands, as declining in this landscape
- Respondents also identified fragmentation of habitats as a concern for this region, especially in an agricultural matrix with little or no corridors and connective habitat leading to increasingly isolated forested areas
- Prevalent invasive species, such as bush honeysuckle, may also be a threat in remaining privately owned woodlots

Conservation Actions Needed

Top Action Categories

The fourth element of the Congressional guidelines requires that the SWAP describe conservation actions proposed to conserve identified species and habitats as well as outlining priorities for their implementation.

This section outlines conservation actions identified on a regional basis for each of the major habitat types. This section follows the same protocol to rate and rank actions in this region based on Salafsky et al. (2008) that was outlined in Chapter V. A full list of survey results can be found in Appendix P. Category rankings for actions and specific section-level actions are outlined in Table 6-9.

Land, water, and species management ranked first regionally and within aquatic systems, agricultural lands, and grasslands. Within the categories, means were used to determine rankings. Because of this, some habitat-specific options with few respondents may have higher threat averages regionally. Overall, top ranked actions within this category reflect a need to control invasive species, restore

natural habitats, and re-establish natural disturbance regimes in a variety of habitat types. Reducing loss of fish and wildlife habitats was identified as the top ranking action within this category for agricultural lands, developed lands, and wetlands; this action was ranked second for forests and grasslands. Developing and promoting farming technologies with conservation benefits was also highly ranked with several land types.

Education and awareness was also ranked highly for this region and was ranked first for developed lands and forests. Educational programs in general (specifically K-12) received average ratings between very and moderately important actions for this region. Respondents identified a need to improve public valuation of resources within this region through education. Respondents also wrote in college- level education as an important action. While improvement of signage was rated between moderately and somewhat important for this region, one respondent specifically identified Spanish language signage as needed in this region.

Land/Water protection was rated first as a category for barren lands and wetlands. In both habitat types, preserving currently existing corridors was rated as the most important action. Regionally, protection of specific habitat types (i.e., wetlands, grasslands, etc.) was also identified as important. Reducing conversion to cropland also received a mean rating of very to moderately important in this region.

While law and policy ranked lower as a category regionally, respondents identified improving compliance and enforcement of current policies as a very to moderately important action. Respondents suggested changes to policies regarding a variety of topics. Revising the drainage code was listed as important for aquatic systems. Changes to deer harvest were suggested as important in this region; respondents suggested both outlawing captive/“canned” deer hunts as well as expanding areas included in the “earn-a-buck” mandate in this region. Respondents emphasized a need for increasing regulations on invasive species, particularly suggesting a ban on the sale of known invasive plants, such as bush honeysuckle and winter creeper.

Table 6-9. Action category rankings to habitats in the Corn Belt Region. First-level action categories are based on the hierarchical method of identifying actions outlined in Salafsky et al. (2008). Ranked action categories for the entire region are arranged by major habitat type.

Category	Regional Ranking	Aquatic Systems	Agricultural Lands	Barren Lands	Developed Lands	Forests	Grasslands	Wetlands
Land/Water/Species Management	1	1	1	2	2	2	1	2
Education and Awareness	2	2	2	2	1	1	2	3
Land/Water Protection	3	3	5	1	3	3	3	1
Law and Policy	4	4	4	4	4	4	4	4
Livelihood, Economic, and Other Incentives	5	6	3	6	6	5	6	6
External Capacity Building	6	5	6	4	5	6	5	5
	Indicates a tie within this habitat type							

Top Specific Actions in Ranked Order

In the Habitat Survey, respondents were also asked to identify specific actions for major habitat types using the same action category ranking system outlined in Salafsky etal.(2008). These second-levelactions representsubcategoriesofactions within the major action categories listed in the table above. The following are the top specific second-level conservation actions for habitats in the Corn Belt Region, aggregated across habitat types:

1. Reduce loss of fish and wildlife habitats (due to agriculture, urban sprawl, commercial development, etc.)
2. Preserve currently existing corridors
3. Promote use of research and science in conservation decision-making processes
4. Develop alliances and partnerships (e.g., between producers, landowners, and conservation professionals)
5. Strengthen conservation financing
6. Develop education programs in general
7. Reduce conversion to cropland
8. Develop and promote farming technologies and practices that have conservation benefits (e.g., cover crops, no-till, and soil health)
9. Increase acres of riparian buffers
10. Reduce nutrient and toxin loads (e.g., heavy metals, pharmaceuticals, fertilizers, insecticides)

The following are top actions for SGCN to occur in the Corn Belt Region, as summarized from the free-response questions about conservation actions for individual species:

1. Educate and engage with landowners and citizens
2. Enhance connectivity of habitats
3. Increase CRP lands and use of conservation easements
4. Protect large contiguous forested areas
5. Implement agricultural practices that improve water quality in aquatic systems and wetlands
6. Limit conversion of habitat to non-habitat
7. Restore and protect riparian corridors
8. Control invasive plants
9. Use burning and mowing as management techniques
10. Protect and manage large wetland complexes

Prioritization of Actions

In order to prioritize these actions within an environment of limited resources, respondents were asked to distribute hypothetical "effort points" to any action they had previously rated as "very important" for any of the major habitat types within a region. The effort ratings were averaged and then ranked to identify the top five actions for each region. A full list of these results can be found in Appendix P. Priority actions for the Corn Belt Region include:

1. Reduce loss of fish and wildlife habitats (due to agriculture, urban sprawl, commercial development, etc.)
2. Reduce conversion to cropland
3. Strengthen conservation financing
4. Develop and promote farming technologies and practices that have conservation benefits (e.g., cover crops, no-till, and soil health)
5. Preserve currently existing corridors

Reducing loss of habitat through agricultural expansion and conversion to cropland echo the identification of agriculture as a threat within this region. Overall, these priority actions are primarily management and protection actions, although strengthening of conservation financing will be vital to successful implementation.

Threats and Actions by Major Habitat Type

The following summaries break down threats and conservation actions in this region by major habitat type, based on responses to the Habitat Survey and the Species Survey. For each major habitat type in this region, the SGCN, top threats to SGCN, top actions for SGCN, key threats to habitats, and priority actions for habitats are summarized on the following pages.

Threats and actions were only included in detail below if a majority of eligible survey respondents, greater than 50%, rated them, to avoid artificially elevating items, which were highly ranked but only by a few respondents. This approach left some threats and action lists with no items for certain habitats, which is illogical from a practical perspective. Therefore, in these situations, the top threats and actions are still listed but are denoted with an asterisk (*) to signify that there may be some items, which seem out-of-place, reflecting a lack of sufficient response for a particular habitat in the survey. This approach and the survey design also caused for some disparities between threats and actions.

Approximately ten items are given for each list below. Lists may be shorter if fewer than ten items were rated by a majority of survey respondents, or longer if there were tires between items.

Top actions for SGCN were summarized from free-response questions about individual species and do not follow the same categorizations as actions for habitats. A full summary of the Habitat Survey responses can be found in Appendix P.

Agricultural Lands

Agricultural lands are defined as lands devoted to commodity production. Examples of agricultural lands include: intensively managed non-native grasses, row crops, fruit and nut-bearing trees, confined feeding operations, and feedlots.

Top threats to SGCN occurring in agricultural lands in the Corn Belt Region:

1. Natural habitat conversion
2. Conversion of habitat to annual crops
3. Annual and perennial non-timber crops
4. Fire and fire suppression
5. Over-mowing of natural areas
6. Dams and water management and use
7. Livestock farming and ranching

Top conservation actions for SGCN occurring in agricultural lands in the Corn Belt Region:

1. Educate and engage with landowners and citizens
2. Use conservation easements on farmland surrounding protected areas
3. Increase and maintain CRP partnerships
4. Implement agricultural practices that improve water quality in aquatic systems and wetlands (for aquatic and wetland species)
5. Maintain shallow-water areas for migrating shorebirds

Top threats to fish and wildlife habitats in agricultural lands in the Corn Belt Region conversion of natural habitats to other land uses:

1. Invasive and alien species
2. Conversion of habitat to annual crops
3. Agriculture, residential, and forestry effluents
4. Changing frequency, duration, and intensity of floods
5. Annual and perennial non-timber crops
6. Housing and urban areas
7. Changing frequency, duration, and intensity of drought
8. Plant diseases
9. Shifting seasons/phenology

Top conservation actions for fish and wildlife habitats in agricultural lands in the Corn Belt Region:

1. Preserve currently existing corridors
2. Reduce loss of fish and wildlife habitats (due to agriculture, urban sprawl, commercial development, etc.)
3. Develop and promote farming technologies and practices that have conservation benefits (e.g., cover crops, no-till, and soil health)
4. Develop alliances and partnerships (e.g., between producers, landowners, and conservation professionals)
5. Promote use of research and science in conservation decision-making processes
6. Reduce conversion to cropland
7. Increase acres of riparian buffers
8. Restore and integrate diversity of habitats into crop-production dominated landscapes
9. Acquire conservation easements to protect important wildlife habitats
10. Build and strengthen CRP partnerships

Aquatic Systems

Aquatic systems are defined as all water habitats, both flowing and stationary. Examples of aquatic systems include: manmade impoundments, natural lakes rivers, streams, oxbows, sloughs, embayments, and backwaters (not including wetlands).

Top threats to SGCN occurring in aquatic systems in the Corn Belt Region
Natural habitat conversion:

1. Conversion of habitat to annual crops
2. Annual and perennial non-timber crops
3. Housing and urban areas
4. Commercial and industrial areas
5. Dams and water management and use
6. Livestock farming and ranching
7. Tourism and recreation areas

Top conservation actions for SGCN occurring in aquatic systems in the Corn Belt Region:

1. Implement agricultural best management practices to improve water quality
2. Reduce point and non-point source pollution
3. Clean polluted areas
4. Enhance public, stakeholder, and landowner education and awareness
5. Protect, restore, and maintain riparian corridors
6. Reduce recreational overuse
7. Maintain floodplain habitat
8. Stabilize banks
9. Remove dams
10. Preserve nest sites for Bald Eagles and Osprey
11. Control invasive aquatic vegetation

Top threats to fish and wildlife habitats in aquatic systems in the Corn Belt Region:

1. Invasive and alien species
2. Conversion of natural habitats to other land uses
3. Agriculture, residential, and forestry effluents
4. Changing frequency, duration, and intensity of floods
5. Annual and perennial non-timber crops
6. Changing frequency, duration, and intensity of drought
7. Temperature extremes
8. Shifting and alteration of habitats due to climate change
9. Conversion of habitat to annual crops
10. Housing and urban areas

Top conservation actions for fish and wildlife habitats in aquatic systems in the Corn Belt Region:

1. Develop and promote farming technologies and practices that have conservation benefits (e.g., cover crops, no-till, and soil health)
2. Reduce nutrient and toxin loads (e.g., heavy metals, pharmaceuticals, fertilizers, insecticides)
3. Preserve currently existing corridors
4. Develop education programs in general
5. Reduce loss of fish and wildlife habitats (due to agriculture, urban sprawl, commercial development, etc.)
6. Strengthen conservation financing
7. Reduce conversion to cropland
8. Reduce stream bank erosion
9. Acquire conservation easements to protect important wildlife habitats
10. Restore habitats and natural systems in aquatic systems

Barren Lands

Barren lands are defined as lands dominated by exposed rock or minerals with sparse vegetation. Examples of barren lands include: sand/dunes, rock outcrops, cliffs, and bare rock.

Top threats to SGCN occurring in barren lands in the Corn Belt Region:

1. Natural habitat conversion
2. Annual and perennial non-timber crops
3. Conversion of habitat to annual crops
4. Dams and water management and use
5. Over-mowing of natural areas
6. Fire and fire suppression

Top conservation actions for SGCN occurring in barren bands in the Corn Belt Region:

1. Educate public about Peregrine Falcon
2. Protect Bald Eagle nest sites
3. Maintain stopover habitat for Kirtland's Warbler

Top threats to fish and wildlife habitats in barren lands in the Corn Belt Region:

1. Invasive and alien species
2. Conversion to other land uses
3. Plant diseases
4. Housing and urban areas
5. Commercial and industrial areas
6. Problematic native species
7. Recreation activities (e.g., ATVs, trail use, horseback riding, high-speed boating, canoeing)
8. Fire and fire suppression
9. Over-mowing of natural areas
10. Introduced genetic material (such as crop, seed stock, bio-control, stocked/released species, etc.)

Top conservation actions for fish and wildlife habitats in barren lands in the Corn Belt Region:

1. Control invasive species in barren lands
2. Develop and promote farming technologies and practices that have conservation benefits (e.g., cover crops, no-till, and soil health)
3. Improve drainage management
4. Increase acres of riparian buffers
5. Protect adjacent buffer zones
6. Reduce nutrient and toxin loads (e.g., heavy metals, pharmaceuticals, fertilizers, insecticides)
7. Re-establish natural disturbance regimes in barren lands
8. Improve enforcement and compliance of current policies
9. Develop alliances and partnerships (e.g., between producers, landowners, and conservation professionals)

Developed Lands

Developed lands are defined as highly impacted lands intensively modified to support human habitation, transportation, commerce, and recreation. Examples of developed lands include: urban lands, suburban lands, industrial areas, commercial areas, towers for communication and wind power generation, and recreational areas such as golf courses and soccer fields.

Top threats to SGCN occurring in developed lands in the Corn Belt Region:

1. Renewable energy production
2. Invasive and alien species
3. Diseases from domestic populations and unknown sources
4. Fossil fuel energy production
5. Mining and quarrying

Top conservation actions for SGCN occurring in developed lands in the Corn Belt Region:

1. Public education and awareness about bat ecology and issues
2. Reduce urban sprawl and commercial property expansion
3. Manage urban areas for Peregrine Falcons; minimize disturbance during nesting
4. Increase gravel-surfaced rooftop habitat for breeding Common Nighthawks
5. Mitigate road hazards for wildlife

Top threats to fish and wildlife habitats in developed lands in the Corn Belt Region:

1. Invasive and alien species
2. Housing and urban areas
3. Commercial and industrial areas
4. Conversion of natural habitats to other land uses
5. Roads and railroads
6. Problematic native species
7. Runoff from roads and service corridors
8. Point and non-point source pollution
9. Plant diseases
10. Air pollution (e.g., smoke, mercury emissions)

Top conservation actions for fish and wildlife habitats in developed lands in the Corn Belt Region:

1. Reduce loss of fish and wildlife habitats (due to agriculture, urban sprawl, commercial development, etc.)
2. Preserve currently existing corridors
3. Restore and integrate diversity of habitats into developed landscapes
4. Control invasive species in developed lands
5. Reduce nutrient and toxin loads (e.g., heavy metals, pharmaceuticals, fertilizers, insecticides)
6. Manage urban woodlots
7. Develop education programs in general
8. Develop education programs specifically for K-12
9. Acquire conservation easements to protect important wildlife habitats
10. Link existing habitat blocks through corridor enhancement in developed lands

Forests

Forests are defined as a plant community dominated by trees. Examples of forests include, but are not limited to, all stages of natural forest and plantations.

Top threats to SGCN occurring in forests in the Corn Belt Region:

1. Natural habitat conversion
2. Conversion of habitat to annual crops
3. Housing and urban areas
4. Commercial and industrial areas
5. Annual and perennial non-timber crops
6. Invasive and alien species
7. Diseases from domestic populations and unknown sources
8. Wood and pulp plantations
9. Fire and fire suppression
10. Tourism and recreation areas
11. Over-mowing of natural areas
12. Livestock farming and ranching
13. Recreation activities
14. Problematic native species

Top conservation actions for SGCN occurring in forests in the Corn Belt Region:

1. Protect large contiguous forested areas and reduce forest fragmentation
2. Limit conversion of forests to non-forest land uses
3. Enhance forest connectivity
4. Control invasive woody plants
5. Reduce development in forested areas
6. Protect roost trees for bat species
7. Restore forests and woodlands
8. Implement best management practices in forestry
9. Create small forest openings to increase diversity
10. Provide downed woody debris for the Least Weasel
11. Remove Brown-headed Cowbirds

Top threats to fish and wildlife habitats in forests in the Corn Belt Region:

1. Invasive and alien species
2. Conversion of natural habitats to other land uses
3. Housing and urban areas
4. Conversion of habitat to annual crops
5. Problematic native species
6. Runoff from roads and service corridors
7. Point source pollution from commercial/industrial sources
8. Commercial and industrial areas
9. Plant diseases
10. Agriculture, residential, and forestry effluents

Top conservation actions for fish and wildlife habitats in forests in the Corn Belt Region:

1. Control invasive species in forests
2. Reduce loss of fish and wildlife habitats (due to agriculture, urban sprawl, commercial development, etc.)
3. Reduce conversion to cropland
4. Preserve currently existing corridors
5. Promote use of research and science in conservation decision-making processes
6. Develop education programs in general
7. Develop education programs specifically for K-12
8. Increase acres of riparian buffers
9. Strengthen conservation financing
10. Increase regulations on invasive species

Grasslands

Grasslands are defined as an open area dominated by grass species. Examples of grasslands include: haylands, pasture, prairies, savannahs, or reclaimed mine lands.

Top threats to SGCN occurring in grasslands in the Corn Belt Region:

1. Conversion of habitat to annual crops
2. Annual and perennial non-timber crops
3. Livestock farming and ranching

Top conservation actions for SGCN occurring in grasslands in the Corn Belt Region

1. Restore and improve connectivity of grasslands
2. Reduce woody encroachment on grasslands
3. Prevent conversion of grassland to cropland
4. Increase CRP grasslands
5. Use conservation easements
6. Implement burning regimes
7. Minimize disturbance to nesting grassland birds (e.g., Henslow's Sparrow)
8. Mow properly (reduce mowing for shorebirds and owls)
9. Improve grazing practices
10. Restore prairies

Top threats to fish and wildlife habitats in grasslands in the Corn Belt Region:

1. Invasive and alien species
2. Conversion of natural habitats to other land uses
3. Conversion of habitat to annual crops
4. Housing and urban areas
5. Annual and perennial non-timber crops
6. Commercial and industrial areas
7. Over-mowing of natural areas
8. Recreation activities (e.g., ATVs, trail use, horseback riding, high-speed boating, canoeing)
9. Introduced genetic material (such as crop, seed stock, bio-control, stocked/released species, etc.)
10. Problematic native species

Top conservation actions for fish and wildlife habitats in grasslands in the Corn Belt Region:

1. Reduce conversion to cropland
2. Develop alliances and partnerships (e.g., between producers, landowners, and conservation professionals)
3. Strengthen conservation financing
4. Reduce loss of fish and wildlife habitats (due to agriculture, urban sprawl, commercial development, etc.)
5. Restore habitats and natural systems in grasslands
6. Increase state's capacity for research and monitoring of conservation actions
7. Promote use of research and science in conservation decision-making processes
8. Acquire currently unprotected grasslands
9. Re-establish natural disturbance regimes in grasslands
10. Build and strengthen CRP partnerships

Wetlands

Wetlands are defined as either ephemeral or permanently flooded habitat. Examples of wetlands include: swamps, marshes, bogs, fens, potholes, wetlands of farmed areas, and mudflats.

Top threats to SGCN occurring in wetlands in the Corn Belt Region:

1. Natural habitat conversion
2. Invasive and alien species
3. Conversion of habitat to annual crops
4. Housing and urban areas
5. Commercial and industrial areas
6. Annual and perennial non-timber crops
7. Tourism and recreation areas
8. Dams and water management and use
9. Problematic native species
10. Recreation activities
11. Fire and fire suppression

Top conservation actions for SGCN occurring in wetlands in the Corn Belt Region:

1. Protect and maintain large wetland complexes
2. Restore wetlands.
3. Protect buffers around wetlands
4. Control invasive plants in wetlands
5. In some cases, actively manage water levels (e.g., for Black Tern, Common Gallinule)
6. Mitigate road hazards to amphibians and reptiles when roads cross over wetlands
7. Minimize disturbance to nesting turtles
8. Manage for high-diversity marshes
9. Encourage enrollment in wetland protection programs
10. Protect and create vernal pools for amphibians

Top threats to fish and wildlife habitats in wetlands in the Corn Belt Region:

1. Invasive and alien species
2. Agriculture, residential, and forestry effluents
3. Conversion of natural habitats to other land uses
4. Shifting and alteration of habitats due to climate change
5. Commercial and industrial areas
6. Changing frequency, duration, and intensity of floods
7. Housing and urban areas
8. Household sewage and urban water waste
9. Livestock farming and ranching
10. Conversion of habitat to annual crops
11. Point source pollution from commercial and industrial sources

Top conservation actions for fish and wildlife habitats in wetlands in the Corn Belt Region:

1. Promote use of research and science in conservation decision-making processes
2. Reduce loss of fish and wildlife habitats (due to agriculture, urban sprawl, commercial development, etc.)
3. Preserve currently existing corridors
4. Develop alliances and partnerships (e.g., between producers, landowners, and conservation professionals)
5. Protect natural water regimes (e.g., withdraws, warm-water discharge).
6. Develop education programs in general
7. Acquire currently unprotected wetlands
8. Control invasive species in wetlands
9. Develop and promote farming technologies and practices that have conservation benefits (e.g., cover crops, no-till, and soil health)
10. Protect adjacent buffer zones
11. Reduce nutrient and toxin loads (e.g., heavy metals, pharmaceuticals, fertilizers, insecticides)

D. VALLEYS AND HILLS REGION

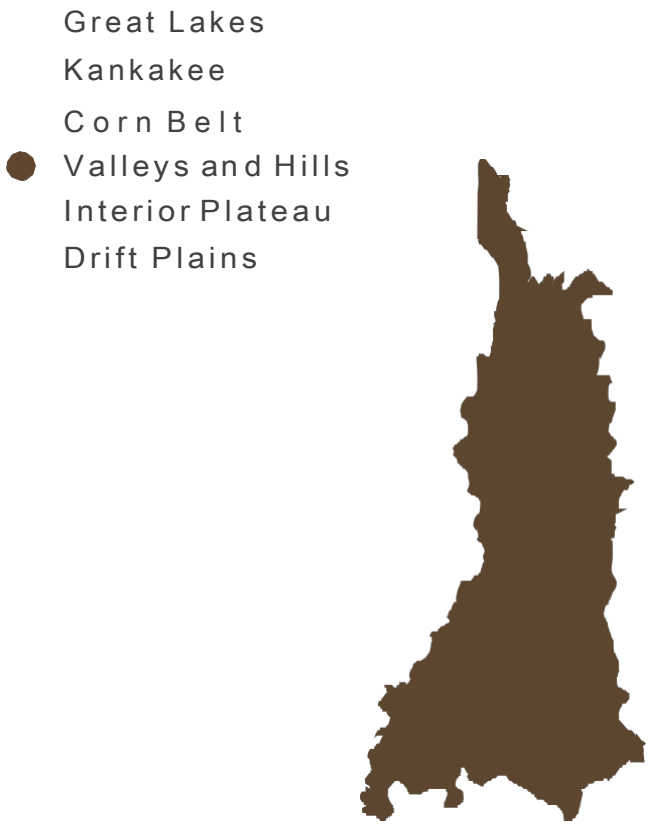


Figure 6-16. Outline of the Valleys and Hills Region in Indiana for the SWAP.

Introduction

This section summarizes habitat conditions, threats to SGCN and their habitats, and conservation actions for species and habitats in the Valleys and Hills Region. This section also reviews land cover changes over the past decade and identifies unique habitat types in this region. Summaries of threats to and conservation actions for SGCN and their habitats that were generated from two surveys can be found at the end of this section.

In addition to the threats and actions identified in the Habitat Survey and the Species Survey, the DFW recognized the need to identify threats aligned with specific actions. Several threats and actions were identified as ubiquitous across all sixregions. These include:

- **Habitat Loss:** Develop and promote farming technologies and practices that have conservation benefits (e.g., cover crops, no-till, and soilhealth)
- **Invasive Species:** Build external capacity (form and facilitate partnerships, alliances, and networks of organizations to address invasive species)
- **Law and Policy:** Develop, change, influence and help implement formal legislation, regulations and voluntary standards
- **Dams and Water Management and Use:** Remove unnecessary dams and utilize necessary dams with effective fish passage structures

The DFW also identified specific threats and actions for each SWAP region based on DFW priorities. These threats were identified due to their high level of relevancy to the specific region and the workability of the associated actions. These threats and actions for the Valleys and Hills Region include:

- **Natural System Modifications:** Re-establish river floodplain connectivity
- **Habitat Degradation of Reclaimed Mine Lands Grasslands:** Buildexternalcapacity by forming partnerships and networks, raising and providing funds and resources for conservation organizations to maintain and protect grasslands
- **Habitat Degradation to Forests:** Control invasive species

Current Habitat Conditions

During the Species Survey, respondents were asked to identify SGCN within the Valleys and Hills Region. A full summary of the Species Survey results can be found in Appendix O.

Table 6-10. Species of Greatest Conservation Need present in the Valleys and Hills Region.

Taxa	Scientific Name	Common Name
Amphibians	*Necturus maculosus*	Common Mudpuppy
Amphibians	*Ambystoma talpoideum*	Mole Salamander
Amphibians	*Acris blanchardi*	Blanchard's Cricket Frog
Amphibians	*Lithobates areolatus*	Crawfish Frog
Amphibians	*Lithobates blairi*	Plains Leopard Frog
Birds	*Cygnus buccinator*	Trumpeter Swan
Birds	*Colinus virginianus*	Northern Bobwhite
Birds	*Chordeiles minor*	Common Nighthawk
Birds	*Antrostomus vociferus*	Eastern Whip-poor-will
Birds	*Laterallus jamaicensis*	Black Rail
Birds	*Rallus elegans*	King Rail
Birds	*Rallus limicola*	Virginia Rail
Birds	*Gallinula galeata*	Common Gallinule
Birds	*Grus canadensis*	Sandhill Crane
Birds	*Grus americana*	Whooping Crane
Birds	*Pluvialis dominica*	American Golden-plover
Birds	*Charadrius melodus*	Piping Plover
Birds	*Bartramia longicauda*	Upland Sandpiper
Birds	*Arenaria interpres*	Ruddy Turnstone
Birds	*Calidris subruficollis*	Buff-breasted Sandpiper
Birds	*Limnodromus griseus*	Short-billed Dowitcher
Birds	*Scolopax minor*	American Woodcock
Birds	*Tringa solitaria*	Solitary Sandpiper
Birds	*Tringa melanoleuca*	Greater Yellowlegs
Birds	*Phalaropus tricolor*	Wilson's Phalarope
Birds	*Sternula antillarum athalassos*	Interior Least Tern
Birds	*Chlidonias niger*	Black Tern
Birds	*Botaurus lentiginosus*	American Bittern
Birds	*Ixobrychus exilis*	Least Bittern
Birds	*Ardea alba*	Great Egret
Birds	*Nycticorax nycticorax*	Black-crowned Night-heron
Birds	*Nyctanassa violacea*	Yellow-crowned Night-heron
Birds	*Pandion haliaetus*	Osprey
Birds	*Ictinia mississippiensis*	Mississippi Kite
Birds	*Haliaeetus leucocephalus*	Bald Eagle
Birds	*Circus cyaneus*	Northern Harrier
Birds	*Accipiter striatus*	Sharp-shinned Hawk

Taxa	Scientific Name	Common Name
Birds	*Buteo platypterus*	Broad-winged Hawk
Birds	*Tyto alba*	Barn Owl
Birds	*Asio flammeus*	Short-eared Owl
Birds	*Falco peregrinus*	Peregrine Falcon
Birds	*Lanius ludovicianus*	Loggerhead Shrike
Birds	*Cistothorus platensis*	Sedge Wren
Birds	*Cistothorus palustris*	Marsh Wren
Birds	*Ammodramus henslowii*	Henslow's Sparrow
Birds	*Xanthocephalus xanthocephalus*	Yellow-headed Blackbird
Birds	*Sturnella neglecta*	Western Meadowlark
Birds	*Helmitheros vermivorum*	Worm-eating Warbler
Birds	*Vermivora chrysoptera*	Golden-winged Warbler
Birds	*Mniotilta varia*	Black-and-white Warbler
Birds	*Setophaga citrina*	Hooded Warbler
Birds	*Setophaga cerulea*	Cerulean Warbler
Fish	*Acipenser fulvescens*	Lake Sturgeon
Fish	*Anguilla rostrata*	American Eel
Fish	*Noturus stigmosus*	Northern Madtom
Fish	*Lepomis symmetricus*	Bantam Sunfish
Fish	*Percina copelandi*	Channel Darter
Fish	*Elassoma zonatum*	Banded Pygmy Sunfish
Fish	*Ammocrypta clara*	Western Sand Darter
Fish	*Etheostoma maculatum*	Spotted Darter
Mammals	*Myotis grisescens*	Gray Myotis
Mammals	*Myotis lucifugus*	Little Brown Myotis
Mammals	*Myotis septentrionalis*	Northern Long-eared Myotis
Mammals	*Myotis sodalis*	Indiana Myotis
Mammals	*Lasionycteris noctivagans*	Silver-haired Bat
Mammals	*Perimyotis subflavus*	Tri-colored Bat
Mammals	*Nycticeius humeralis*	Evening Bat
Mammals	*Lasiurus borealis*	Eastern Red Bat
Mammals	*Lasiurus cinereus*	Hoary Bat
Mammals	*Sylvilagus aquaticus*	Swamp Rabbit
Mammals	*Mustela nivalis*	Least Weasel
Mammals	*Taxidea taxus*	American Badger
Mollusks	*Cyprogenia stegaria*	Fanshell
Mollusks	*Obovaria subrotunda*	Round Hickorynut
Mollusks	*Plethobasus cyphyus*	Sheepnose
Mollusks	*Pleurobema cordatum*	Ohio Pigtoe
Mollusks	*Potamilus capax*	Fat Pocketbook
Mollusks	*Ptychobranchus fasciolaris*	Kidneyshell
Mollusks	*Quadrula cylindrica cylindrica*	Rabbitsfoot

Taxa	Scientific Name	Common Name
Mollusks	*Villosa lienosa*	Little Spectaclecase
Reptiles	*Macrochelys temminckii*	Alligator Snapping Turtle
Reptiles	*Kinosternon subrubrum*	Eastern Mud Turtle
Reptiles	*Terrapene carolina*	Eastern Box Turtle
Reptiles	*Pseudemys concinna*	River Cooter
Reptiles	*Thamnophis proximus*	Western Ribbonsnake
Reptiles	*Nerodia erythrogaster neglecta*	Copper-bellied Watersnake
Reptiles	*Clonophis kirtlandii*	Kirtland's Snake
Reptiles	*Opheodrys aestivus*	Rough Greensnake
Reptiles	*Farancia abacura*	Red-bellied Mudsnake
Reptiles	*Agkistrodon piscivorus*	Cottonmouth

During the Habitat Survey, respondents were asked to evaluate the overall quality of fish and wildlife habitats in the Valleys and Hills Region (Fig. 6-17), estimate changes in overall quality since 2005 (Fig. 6-18), and predict changes in overall quality over the next ten years (Fig. 6-19). Each respondent was asked to respond for one or more of the eight major habitat types within the region and results were aggregated at the regional level. A full list of the Habitat Survey results can be found in Appendix P.

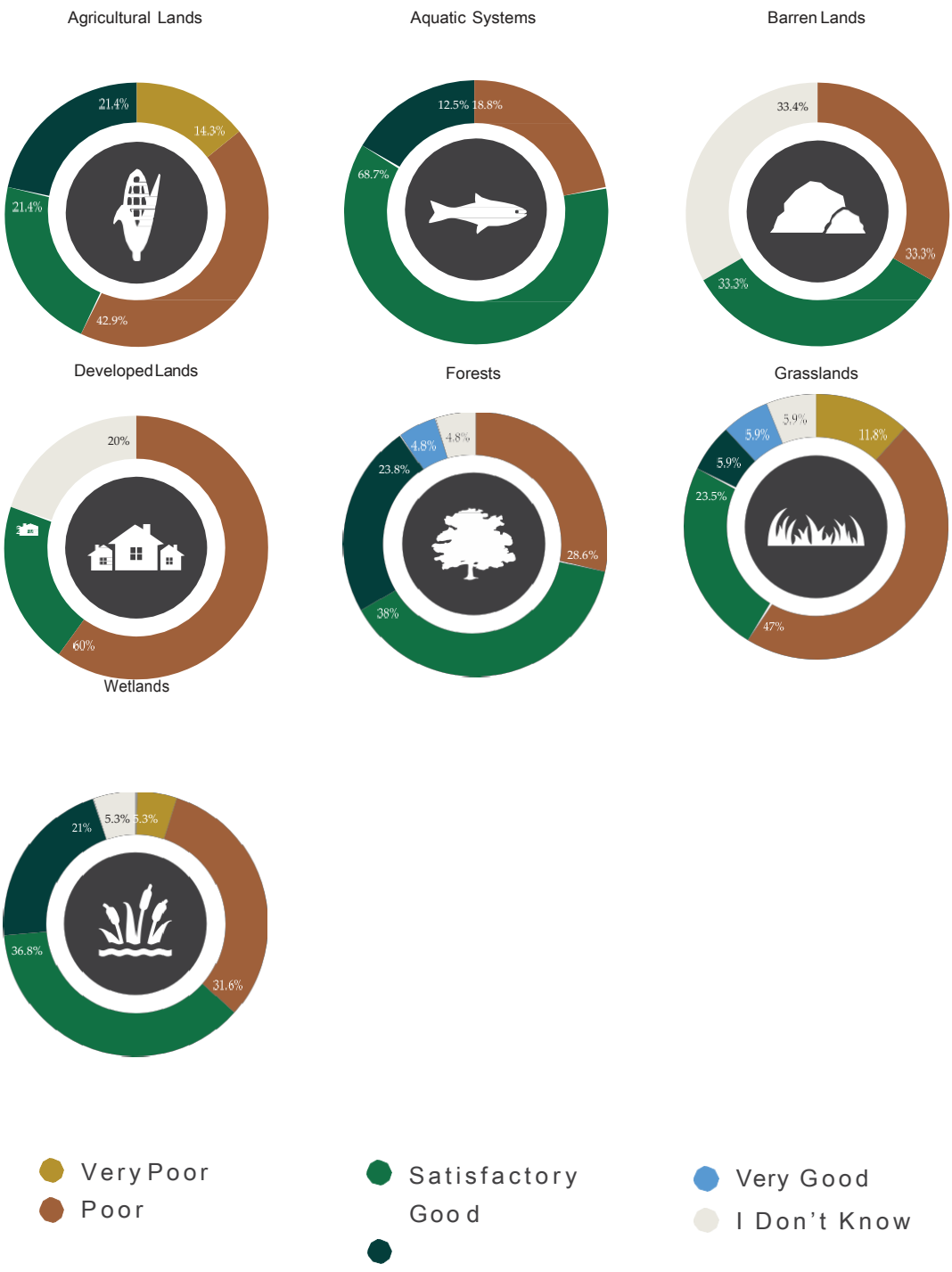


Figure 6-17. Overall quality of fish and wildlife habitats in the Valleys and Hills Region in 2014.

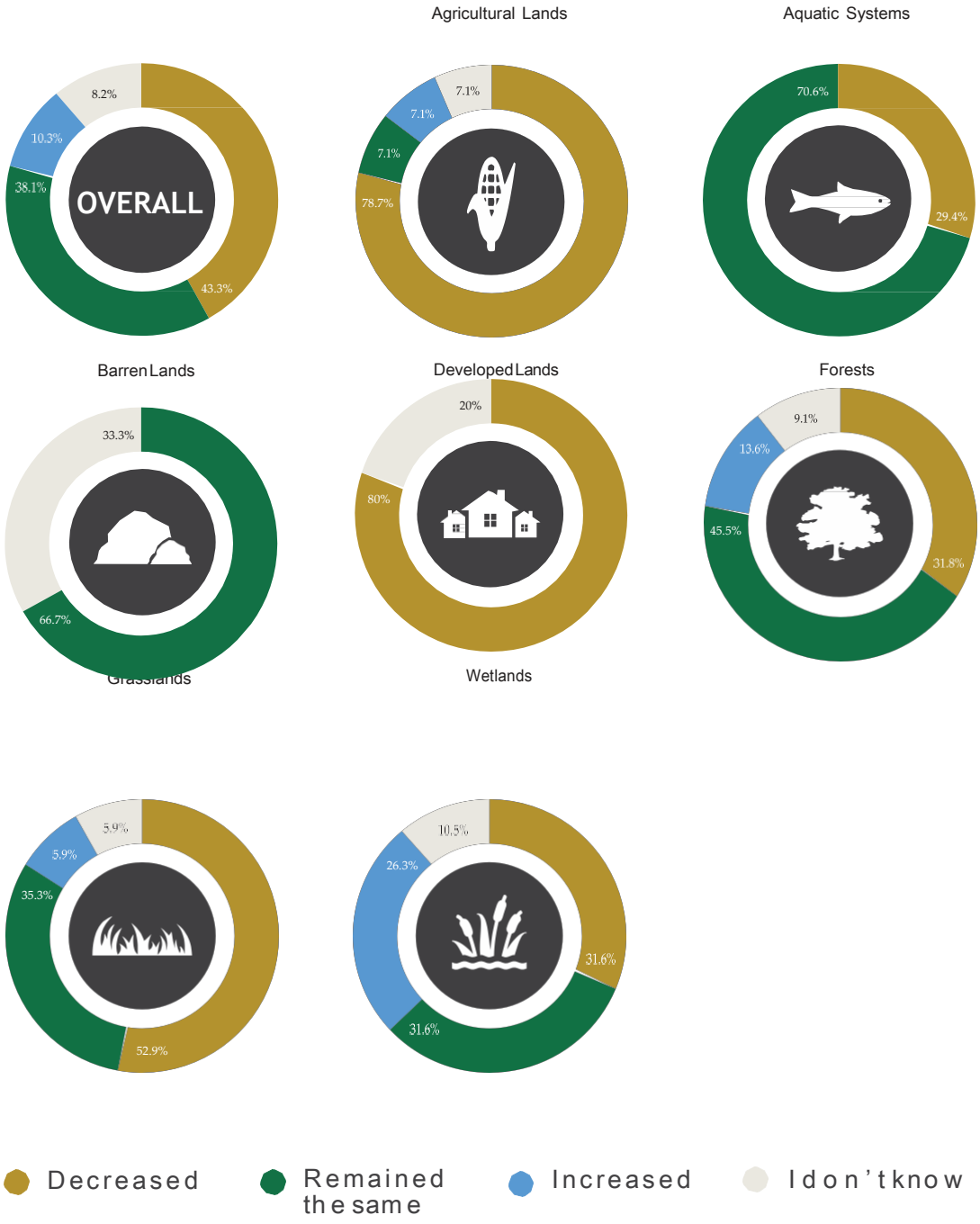


Figure 6-18. Estimated change in the overall quality of fish and wildlife habitats from 2005 to 2014 for each of the major habitat types in the Valleys and Hills Region.

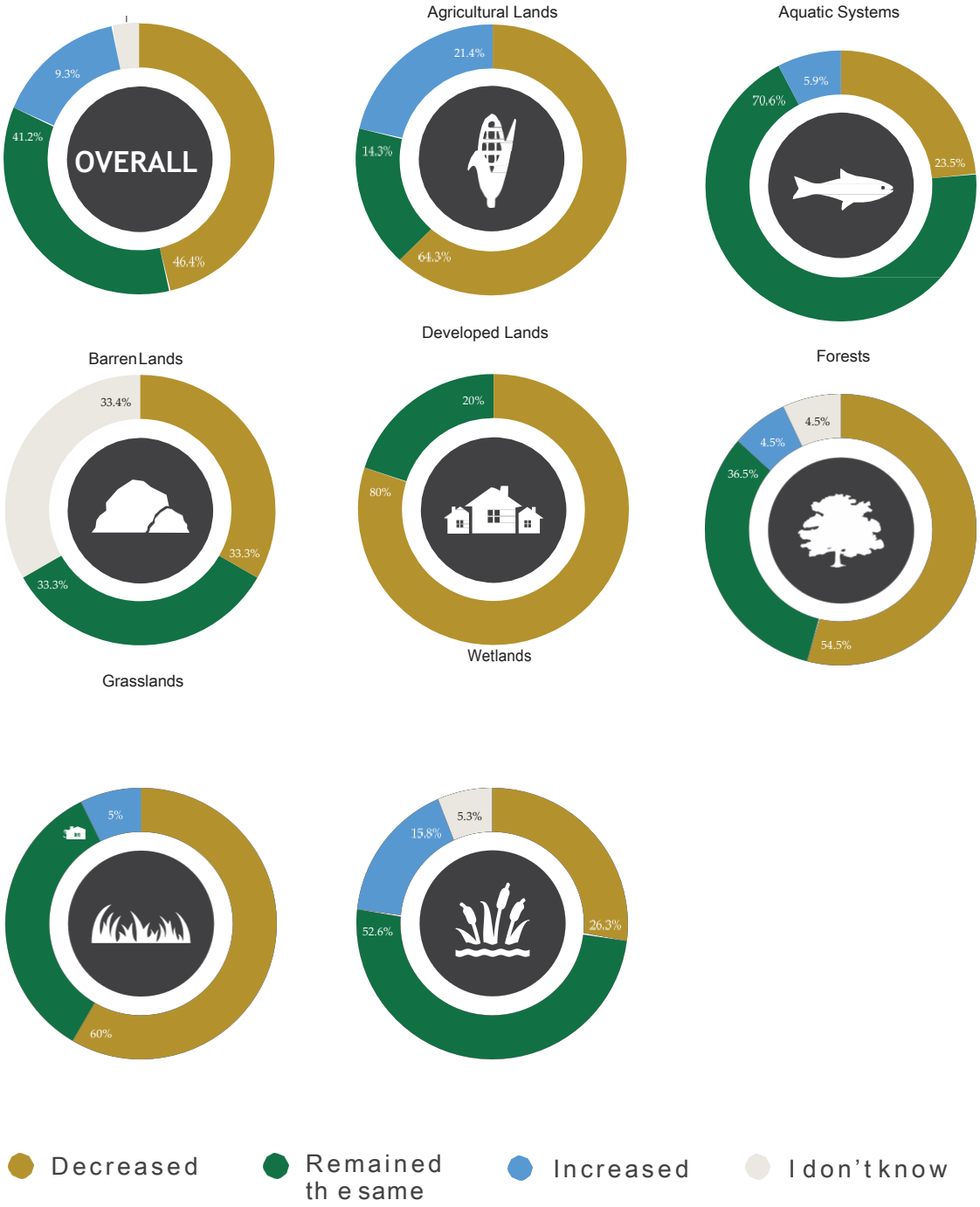
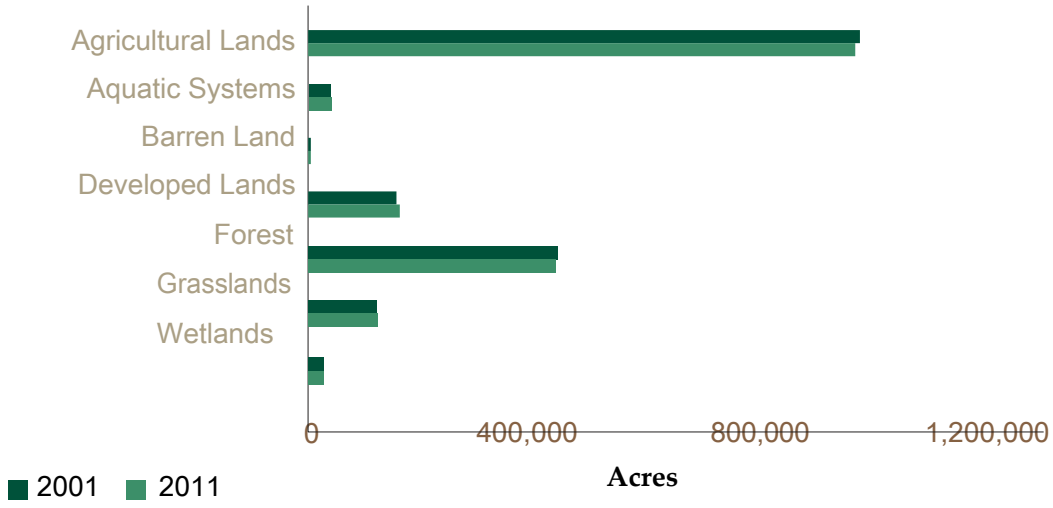


Figure 6-19. Predicted changes in overall quality of fish and wildlife habitats over the next ten years for each major habitat type in the Valleys and Hills Region.

Changes in Land Cover

Most land cover in the Valleys and Hills Region consists of agricultural lands, followed by forests, developed lands, and grasslands (Fig. 6-20). Compared to other Indiana regions, with the exception of the Great Lakes Region, the Valleys and Hills Region has the highest percentage of aquatic systems at 2.1%. This region is comprised of more forests than other northern Indiana regions at 24.9%, but is the least forested region in southern Indiana. Wetlands are more abundant at 1.4% than other regions in southern Indiana.

The Valleys and Hills Region has experienced changes in habitat coverage over the past ten years. Aquatic systems, barren lands, developed lands, grasslands, and wetlands increased, while agriculture and forests decreased (Table 6-11). These habitats were mostly lost to urban development, and agriculture lost the most cover in terms of total acreage (Fig. 6-20). Percentage-wise, the greatest net losses were seen in forests (1.2%) and agricultural lands (0.6%). The greatest net increases were seen in barren lands (232.3%), aquatic systems (4.4%), and developed lands (3.4%). This increase may be due to expansion of surface mining, which is prevalent in the Valleys and Hills Region.



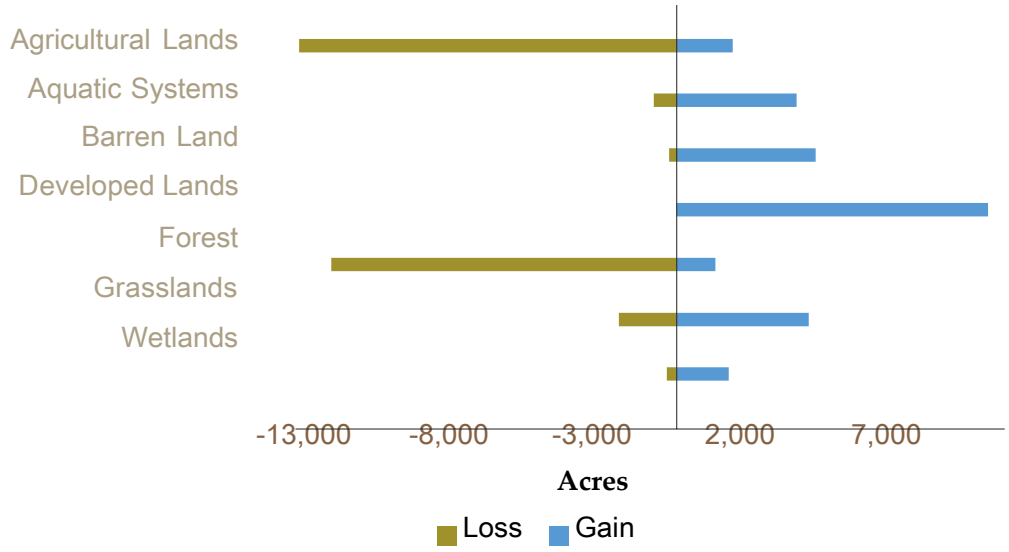


Figure 6-20. Distribution of land cover and losses and gains in land cover in the Valleys and Hills Region between 2001 and 2011 from NLCD.

Threats Affecting Habitats

Top Threat Categories

The third element requires the description of threats to SGCN and their habitats. The SWAP identifies a habitat perspective in order to manage for the conservation of species in Indiana. This section utilizes the same hierarchical method of identifying and rating threats based on Salafsky et al. (2008) that was outlined in Chapter V. Category rankings and specific threat rankings for habitats in this region are outlined below (Table 6-11). A full summary of the Habitat Survey results for the Great Lakes Region can be found in Appendix P.

For first-level threat categories, agriculture and aquaculture, invasive and other problematic species and genes, and residential and commercial development received mean ratings as categories between significant and moderate threats. All other threat categories, with the exception of biological resource use were, on average, rated between a moderate and minor threat. Biological resource use was rated as minor to not a threat as a category.

Agriculture and aquaculture was the top ranked first-level threat regionally and within each habitat type with the exception of developed lands. Conversion of habitat to agriculture as well as annual and perennial non-timber crops in general were identified as the most significant specific second-level threats in this area. Respondents noted particular threats may stem from the draining and destruction of wetlands for agricultural purposes. Livestock was rated as a moderate to minor threat, while both aquaculture and wood and pulp plantations were not identified above a minor threat across habitat types.

The invasive and other problematic species and genes category was rated relatively high across habitat types, but especially highly in grasslands and wetlands. Alien species was identified as the most significant threat across habitat types within this region. Problematic native species, introduced genetic material, and plant diseases were only ranked as moderate to minor threats.

Residential and commercial development was rated third overall but first for habitats in developed lands. Both housing and urban areas and commercial development were specifically rated within this category as significant to moderate threats, while development associated with tourism and recreation areas was identified as a moderate to minor threat.

Energy production and mining was rated slightly higher as a threat in barren lands compared to other habitat types. Both mining and fossil fuel production were identified as significant threats within this category for barren lands and aggregated across all habitat types. Oil and gas drilling and shale gas development were identified as moderate to minor in this region. Renewable energy production was identified as minor to not a threat to fish and wildlife habitats.

Pollution was rated as a more significant threat in aquatic systems and to habitats in agricultural lands compared to other habitat types. Agriculture, residential, and forestry effluents were identified as a significant to moderate threat in both of these habitat types. Point source pollution was additionally identified as a significant to moderate threat for habitats in agricultural lands.

Human intrusion and disturbance and recreational activities as a specific threat within this category were both rated as moderate to minor threats for this region across all habitat types. Natural systems modification as a category was also identified as moderate to minor. However, conversion of habitat to other uses was identified as a significant to moderate threat, reinforcing the significance of this issue as it was identified prior as conversion to agriculture.

Within transportation and service corridors, only roads and railroads were identified as significant to moderate specific threats across habitat types. Utility and service lines were rated as a moderate to minor threat. Both flight paths and shipping lanes were identified as minor to non-threats for this region.

While other stressors as a category was rated as a moderate to minor threat, both diseases and low genetic diversity were individually ranked as significant to moderate threats across habitat types. Climate change and severe weather similarly was ranked lower across habitats as a category, all of the specific threats within this category were identified as significant to moderate threat across all habitat types in this region.

Biological resource use was identified as a minor to non-threat for habitats within this region. However, forestry practices were rated as a moderate to minor threat, with one respondent pointing specifically to lack of sustainable timber management in natural systems modification as a point of stress for fish and wildlife habitats in this region.

Table 6-11. Threat category ranking to habitats in the Valleys and Hills Region. First-level threat categories are based on the hierarchical method of identifying threats outlined in Salafsky et al (2008). Ranked threats are arranged by each major habitat type (1 - highest threat).

Category	Regional Ranking	Aquatic Systems	Agricultural Lands	Barren Lands	Developed Lands	Forests	Grasslands	Wetlands
Agriculture and Aquaculture	1	1	1	1	2	1	1	1
Invasive and Other Problematic Species and Genes	2	3	4	4	3	3	2	2
Residential and Commercial Development	3	5	3	6	1	2	3	5
Energy Production and Mining	4	4	6	2	7	4	4	4
Pollution	5	2	2	5	4	8	9	3
Human Intrusion and Disturbance	6	6	7	8	5	5	6	7
Natural Systems Modification	7	7	5	7	8	7	5	6
Transportation and Service Corridors	8	8	8	9	6	6	7	10
Other Stressors	9	10	10	3	9	9	8	9
Climate Change and Severe Weather	10	9	9	10	11	11	10	8
Biological Resource Use	11	11	11	11	10	10	11	11

Top Specific Threats in Ranked Order

In the Habitat Survey, respondents were also asked to identify specific threats to major habitat types using the same threat category ranking system outlined in Salafsky et al. (2008). These second-level threats represent subcategories of threats within the major threat categories listed in the table above. The following are the top specific second-level threats to habitats in the Valleys and Hills Region, aggregated across habitat types:

1. Invasive and alien species
2. Conversion of habitat to annual crops
3. Conversion of natural habitats to other land uses
4. Housing and urban areas
5. Mining and quarrying
6. Annual and perennial non-timber crops
7. Commercial and industrial areas
8. Agriculture, residential, and forestry effluents
9. Fossil fuel energy production
10. Point source pollution from commercial and industrial sources

In the Species Survey, respondents were also asked to identify threats to individual SGCN using the same threat category ranking system. The following are the top specific second-level threats to SGCN occurring in the Valleys and Hills Region, aggregated across all species:

1. Invasive and alien species
2. Natural habitat conversion
3. Conversion of habitat to annual crops
4. Housing and urban areas
5. Annual and perennial non-timber crops
6. Commercial and industrial areas
7. Dams and water management and use
8. Tourism and recreation areas
9. Recreational activities
10. Livestock farming and ranching

Emerging/Anticipated Threats

Respondents were asked specifically to identify any emerging or anticipated threats over the next ten years for fish and wildlife habitats within the major habitat types for a region in a free-response question.

Respondents anticipate a development "boom" associated with construction of an interstate in coming years, which may increase potential for introduction of exotic and invasive species on top of modifying natural systems. The construction may also lead to fragmentation. Loss of wetland habitat, exotic species establishing in wetland habitats, and mine reclamation areas not being converted to wetland habitat types were a concern for this region as well.

Conservation Actions Needed

Top Action Categories

The fourth element of the Congressional guidelines requires that the SWAP describe conservation actions proposed to conserve identified species and habitats as well as outlining priorities for their implementation. This section outlines conservation actions identified on a regional basis for each of the major habitat types. This section follows the same protocol to rate and rank actions in this region based on Salafsky et al. (2008) that was outlined in Chapter V. A full list of survey results can be found in Appendix P. Category rankings for actions and specific second-level actions are outlined in Table 6-12.

Within this region, land, water, and species management, land and water protection, and education and awareness received average category rankings between very and moderately important. Law and policy, external capacity building, and livelihood, economic, and other incentives received average category ratings between moderately and somewhat important. No action category was

rated between somewhat important and not important, indicating a general importance for a variety of actions within this region.

Land, water, and species management was ranked first regionally and within barren lands, forests, grasslands, and wetlands. Top actions within this region indicate an importance to restore natural systems, disturbance regimes, and diversity of successional stages in a variety of habitat types including grasslands and wetlands. Reducing loss of fish and wildlife habitat to agriculture and development was also identified as an important action, ranking first in developed lands and forests. Developing and promoting farming technologies and practices with conservation benefit ranked first for habitats within aquatic systems, agricultural lands, and wetlands. Mine reclamation was ranked first for barren lands.

Land and water protection was ranked second regionally, first within aquatic systems, and tied for first within barren lands. Acquiring unprotected systems and reducing conversion to cropland was identified important regionally as well as within most individual habitat types, ranking first in barren lands, developed lands, and wetlands. Acquiring easements was ranked first for fish and wildlife habitats within agricultural lands. Building and strengthening CRP partnerships was identified as most important for aquatic systems within this category.

Education and awareness was ranked third regionally as a category; however, it was ranked first for agricultural lands and developed lands. Within this category, educational programs specifically for K-12, educational programs in general, and training programs for stakeholders all received average ratings between very and moderately important.

Law and policy was ranked fourth regionally and varied between ranking fourth and sixth for various habitat types. Across the region, improvement of compliance and enforcement of current policies was ranked first. Some respondents suggested a need for changes to current policies to benefit fish and wildlife habitat within this region and suggested changes to regulations for energy production, including mining, oil, and gas laws.

Livelihood, economic, and other incentives was ranked fifth regionally but third for fish and wildlife habitats in agricultural lands. Promotion of conservation payment programs was ranked first regionally and within aquatic systems, agricultural lands, barren lands, developed lands, grasslands, andforests. Promotion of nonmonetary values of natural systems was ranked first within wetlands.

While external capacity building was ranked sixth regionally, five of the six specific actions were rated between very and moderately important. Developing alliances and partnerships was ranked first regionally and first for agricultural lands, barren lands, developed lands, forests, and grasslands. Strengthening conservation financing was ranked first in aquatic systems and wetlands.

Table 6-12. Action category ranking to habitats in the Valleys and Hills Region. First-level categories are based on the hierarchical method of identifying actions outlined in Salafsky et al. (2008). Ranked action categories for this region are arranged by major habitat type.

Category	Regional Ranking	Aquatic Systems	Agricultural Lands	Barren Lands	Developed Lands	Forests	Grasslands	Wetlands
Land/Water/Species Management	1	3	2	1	3	1	1	1
Land/Water Protection	2	1	5	1	2	2	2	2
Education and Awareness	3	2	1	3	1	3	3	3
Law and Policy	4	4	6	4	5	5	5	4
Livelihood, Economic, and Other Incentives	5	5	3	4	4	4	4	6
External Capacity Building	6	6	4	6	6	6	6	5
	Indicates a tie within this habitat type							

Top Specific Actions in Ranked Order

In the Habitat Survey, respondents were also asked to identify specific actions for major habitat types using the same action category ranking system outlined in Salafsky etal.(2008). These second-levelactions representsubcategoriesofactions within the major action categories listed in the table above. The following are the top specific (second-level) conservation actions for habitats in the Valleys and Hills Region, aggregated across habitattypes:

1. Reduce conversion to cropland
2. Reduce loss of fish and wildlife habitats (due to agriculture, urban sprawl, commercial development, etc.)
3. Preserve currently existing corridors
4. Develop alliances and partnerships (e.g., between producers, landowners, and conservation professionals)
5. Acquire conservation easements to protect important wildlife habitats
6. Promote use of research and science in conservation decision-making processes
7. Develop education programs specifically for K-12
8. Develop education programs in general
9. Develop and promote farming technologies and practices that have conservation benefits (e.g., cover crops, no-till, and soil health)
10. Strengthen conservation financing

The following are top actions for SGCN occurring for the Valleys and Hills Region, as summarized from the free-response questions about conservation actions for individual species:

1. Educate and engage with landowners and citizens.
2. Enhance connectivity of habitats
3. Reclaim coal mine grasslands
4. Restore and protect bottomland hardwood forests and floodplain swamps
5. Protect and restore river corridors
6. Protect large contiguous forested areas
7. Protect and manage large wetland complexes
8. Control invasive plants
9. Use burning and mowing as grassland management techniques
10. Implement agricultural practices that improve water quality

Prioritization of Actions

In order to prioritize these actions within an environment of limited resources, respondents were then asked to distribute hypothetical "effort points" to any action they had previously rated as "very important" for any of the major habitat types within a region. The effort ratings were averaged and then ranked to identify the top five actions for a region. A full list of these results can be found in Appendix P. Priority actions for the Valleys and Hills region include:

1. Preserve currently existing corridors
2. Acquire currently unprotected wetlands
3. Develop and promote farming technologies and practices that have conservation benefits (e.g., cover crops, no-till, and soil health)
4. Reduce conversion to cropland
5. Acquire currently unprotected grasslands

While land, water, and species management actions were, on average, rated as most important, land and water protection-based actions, with an emphasis on acquiring wetland and grassland habitats within this region, were also ranked highly.
Promotion of farming technologies and practices that have conservation benefits and reduce conversion to cropland reflect the identification of agriculture as a large threat to fish and wildlife habitats within this region.

Threats and Actions by Major Habitat Type

The following summaries break down threats and conservation actions in this region by major habitat type, based on responses to the Habitat Survey and the Species Survey. The SGCN that occur there, top threats to SGCN, top actions for SGCN, key threats to habitats, and priority actions for each major habitat type in this region are summarized on the following pages.

Threats and actions were only included in detail below if a majority of eligible survey respondents, greater than 50%, rated them, to avoid artificially elevating items, which were highly ranked but only by a few respondents. This approach left some threats and action lists with no items for certain habitats, which is illogical from a practical perspective. Therefore, in these situations, the top threats and actions are still listed but are denoted with an asterisk (*) to signify that there may be some items, which seem out-of-place, reflecting a lack of sufficient response for a particular habitat in the survey. This approach and the survey design also caused for some disparities between threats and actions.

Approximately ten items are given for each list below. Lists may be shorter if fewer than ten items were rated by a majority of survey respondents, or longer if there were tires between items.

Top actions for SGCN were summarized from free-response questions about individual species and do not follow the same categorizations as actions for habitats. A full summary of the Habitat Survey responses can be found in Appendix P.

Agricultural Lands

Agricultural lands are defined as lands devoted to commodity production. Examples of agricultural lands include: intensively managed non-native grasses, row crops, fruit and nut-bearing trees, confined feeding operations, and feedlots.

Top threats to SGCN occurring in agricultural lands in the Valleys and Hills Region:

1. Conversion of habitat to annual crops
2. Annual and perennial non-timber crops

Top Conservation actions for SGCN occurring in agricultural lands in the Valleys and Hills Region:

1. Educate and engage with landowners and citizens
2. Reduce conversion of farmland to development
3. Increase use of CRP partnerships
4. Increase use of conservation easements
5. Implement agricultural practices that improve water quality
6. Maintain shallow-water areas for migrating shorebirds
7. Establish no-plow zones

Top threats to fish and wildlife habitats in agricultural lands in the Valleys and Hills Region:

1. Conversion of habitat to annual crops
2. Conversion of natural habitats to other land uses
3. Commercial and industrial areas
4. Housing and urban areas
5. Mining and quarrying
6. Invasive and alien species
7. Annual and perennial non-timber crops
8. Point source pollution from commercial and industrial sources
9. Agriculture, residential, and forestry effluents
10. Oil and gas drilling

Top conservation actions for fish and wildlife habitats in agricultural lands in the Valleys and Hills Region:

1. Acquire conservation easements to protect important wildlife habitats
2. Reduce conversion of habitat to cropland
3. Develop and promote farming technologies and practices that have conservation benefits (e.g., cover crops, no-till, and soil health)
4. Reduce loss of fish and wildlife habitats (due to agriculture, urban sprawl, commercial development, etc.)
5. Preserve currently existing corridors
6. Increase acres of riparian buffers
7. Link existing habitat blocks through corridor enhancement in agricultural lands
8. Develop education programs in general
9. Establish training programs for stakeholders
10. Develop alliances and partnerships (e.g., between producers, landowners, and conservation professionals)
11. Promote use of research and science in conservation decision-making processes

Aquatic Systems

Aquatic systems are defined as all water habitats, both flowing and stationary. Examples of aquatic systems include: manmade impoundments, natural lakes rivers, streams, oxbows, sloughs, embayments, and backwaters (not including wetlands).

Top threats to SGCN occurring in aquatic systems in the Valleys and Hills Region:

1. Natural habitat conversion
2. Conversion of habitat to annual crops
3. Annual and perennial non-timber crops
4. Dams and water management and use
5. Livestock farming and ranching

Top conservation actions for SGCN occurring in aquatic systems in the Valleys and Hills Region:

1. Implement agricultural best management practices to improve water quality
2. Protect and restore river corridors
3. Enhance public, stakeholder, and landowner education and awareness
4. Reduce point and non-point source pollution
5. Protect/restore riparian buffer zones
6. Restore floodplains and connect to rivers
7. Remove dams
8. Reduce sediment and nutrient loads
9. Reduce bank erosion
10. Protect oxbow lakes and sloughs
11. Restrict draining of floodplain lakes
12. Improve ditch maintenance
13. Prohibit take of mussels

Top threats to fish and wildlife habitats in aquatic systems in the Valleys and Hills Region:

1. Invasive and alien species
2. Agriculture, residential, and forestry effluents
3. Annual and perennial non-timber crops
4. Housing and urban areas
5. Conversion of natural habitats to other land uses
6. Conversion of habitat to annual crops
7. Mining and quarrying
8. Commercial and industrial areas
9. Point source pollution from commercial and industrial sources
10. Fossil fuel energy production
11. Problematic native species

Top conservation actions for fish and wildlife habitats in aquatic systems in the Valleys and Hills Region:

1. Develop and promote farming technologies and practices that have conservation benefits (e.g., cover crops, no-till, and soil health)
2. Develop education programs in general
3. Reduce nutrient and toxin loads (e.g., heavy metals, pharmaceuticals, fertilizers, insecticides)
4. Acquire currently unprotected aquatic systems
5. Acquire conservation easements to protect important wildlife habitats
6. Develop education programs specifically for K-12
7. Preserve currently existing corridors
8. Reduce conversion of habitat to annual crops
9. Increase acres of riparian buffers
10. Reduce loss of fish and wildlife habitats (due to agriculture, urban sprawl, commercial development, etc.)
11. Develop alliances and partnerships (e.g., between producers, landowners, and conservation professionals)

Barren Lands

Barren lands are defined as lands dominated by exposed rock or minerals with sparse vegetation. Examples of barren lands include: sand/dunes, rock outcrops, cliffs, and bare rock.

Top threats to SGCN occurring in barren lands in the Valleys and Hills Region:*

1. Annual and perennial non-timber crops
2. Natural habitat conversion
3. Conversion of habitat to annual crops
4. Recreation activities
5. Dams and water management and use

Top conservation actions for SGCN occurring in barren lands in the Valleys and Hills Region:

1. Educate public about Peregrine Falcon
2. Protect Bald Eagle nest sites

Top threats to fish and wildlife habitats in barren lands in the Valleys and Hills Region:

1. Conversion of habitat to annual crops
2. Mining and quarrying
3. Fossil fuel energy production
4. Conversion of habitat to other land uses
5. Annual and perennial non-timber crops
6. Livestock farming and ranching
7. Shale gas development
8. Household sewage and urban water waste
9. Agriculture, residential, and forestry effluents

Top conservation actions for fish and wildlife habitats in barren lands in the Valleys and Hills Region:

1. Preserve currently existing corridors
2. Reduce conversion to cropland
3. Build/Strengthen CRP partnerships
4. Mine reclamation
5. Promote conservation payment programs (e.g., payment for ecosystem services, conservation easements)
6. Promote nonmonetary values of natural systems within the state
7. Manage recreational opportunities to be compatible with fish and wildlife habitats

Developed Lands

Developed lands are defined as highly impacted lands intensively modified to support human habitation, transportation, commerce, and recreation. Examples of developed lands include: urban lands, suburban lands, industrial areas, commercial areas, towers for communication and wind power generation, and recreational areas such as golf courses and soccer fields.

Top threats to SGCN occurring in developed lands in the Valleys and Hills Region*:

1. Housing and urban areas
2. Commercial and industrial areas
3. Renewable energy production
4. Conversion of habitat to annual crops
5. Invasive and alien species
6. Diseases from domestic populations and unknown sources
7. Mining and quarrying
8. Fossil fuel energy production
9. Tourism and recreation areas
10. Wood and pulp plantations

Top conservation actions for SGCN occurring in developed lands in the Valleys and Hills Region:

1. Public education and awareness about bat ecology and issues
2. Reduce urban sprawl and commercial property expansion
3. Manage urban areas for Peregrine Falcons; minimize disturbance during nesting
4. Increase gravel-surfaced rooftop habitat for breeding Common Nighthawks
5. Limit mowing along roads

Top threats to fish and wildlife habitats in developed lands in the Valleys and Hills Region:

1. Invasive and alien species
2. Roads and railroads
3. Housing and urban areas
4. Runoff from roads and service corridors
5. Air pollution
6. Annual and perennial non-timber crops
7. Conversion of habitat to annual crops
8. Commercial and industrial areas

Top conservation actions for fish and wildlife habitats in developed lands in the Valleys and Hills Region:

1. Reduce loss of fish and wildlife habitats (due to agriculture, urban sprawl, commercial development, etc.)
2. Develop education programs specifically for K-12
3. Increase acres of riparian buffers
4. Link existing habitat blocks through corridor enhancement in developed lands
5. Develop alliances and partnerships (e.g., between producers, landowners, and conservation professionals)
6. Promote use of research and science in conservation decision-making processes
7. Preserve currently existing corridors
8. Acquire conservation easements to protect important wildlife habitats

Forests

Forests are defined as a plant community dominated by trees. Examples of forests include, but are not limited to, all stages of natural forest and plantations.

Top threats to SGCN occurring in forests in the Valleys and Hills Region:*

1. Conversion of habitat to annual crops
2. Natural habitat conversion
3. Housing and urban areas
4. Invasive and alien species
5. Commercial and industrial areas
6. Annual and perennial non-timber crops
7. Renewable energy production
8. Diseases from domestic populations and unknown sources
9. Fossil fuel energy production
10. Mining and quarrying
11. Tourism and recreation areas
12. Wood and pulp plantations
13. Fire and fire suppression

Top conservation actions for SGCN occurring in forests in the Valleys and Hills Region:

1. Protect large contiguous forested areas and reduce forest fragmentation
2. Limit conversion of forests to non-forest land uses
3. Restore and protect bottomland hardwood forests
4. Control invasive woody plants
5. Reduce development in forested areas
6. Manage for healthy forest edge habitats
7. Protect roost trees for bat species
8. Restore forests and woodlands
9. Create small forest openings to increase diversity
10. Implement best management practices in forestry

Top threats to fish and wildlife habitats in forests in the Valleys and Hills Region:

1. Invasive and alien species
2. Conversion of habitat to annual crops
3. Housing and urban areas
4. Mining and quarrying
5. Conversion of natural habitats to other land uses
6. Fossil fuel energy production
7. Annual and perennial non-timber crops
8. Problematic native species
9. Commercial and industrial areas
10. Oil and gas drilling

Top conservation actions for fish and wildlife habitats in forests in the Valleys and Hills Region:

1. Reduce loss of fish and wildlife habitats (due to agriculture, urban sprawl, commercial development, etc.)
2. Preserve currently existing corridors
3. Restore habitats and natural systems in forests
4. Promote diversity of forest types and successional stages
5. Reduce conversion to cropland
6. Control invasive species in forests
7. Link existing habitat blocks through corridor enhancement in forests
8. Re-establish natural disturbance regimes in forests
9. Develop education programs specifically for K-12
10. Promote conservation payment programs (e.g., payment for ecosystem services, conservation easements

Grasslands

Grasslands are defined as an open area dominated by grass species. Examples of grasslands include: haylands, pasture, prairies, savannahs, or reclaimed mine lands. Top threats to SGCN occurring in grasslands in the Valleys and Hills Region:

1. Conversion of habitat to annual crops
2. Annual and perennial non-timber crops

Top conservation actions for SGCN occurring in grasslands in the Valleys and Hills Region:

1. Restore and improve connectivity of grasslands
2. Reduce conversion of grasslands to coal mines
3. Reclaim coal mine grasslands
4. Increase use of conservation easements
5. Maintain large tracts of grasslands
6. Reduce woody encroachment on grassland
7. Increase CRP grasslands
8. Implement proper burning regimes
9. Minimize disturbance to nesting grassland birds (e.g., Henslow's Sparrow.
10. Mow properly (reduce mowing for shorebirds and owls)
11. Improve grazing practices
12. Preserve low, wet fields

Top threats to fish and wildlife habitats in grasslands in the Valleys and Hills Region:

1. Conversion of habitat to annual crops
2. Invasive and alien species
3. Housing and urban areas
4. Annual and perennial non-timber crops
5. Commercial and industrial areas
6. Livestock farming and ranching
7. Introduced genetic material (such as crop, seed stock, bio-control, stocked/released species,etc.)
8. Problematic native species
9. Tourism and recreation areas
10. Aquaculture

Top conservation actions for fish and wildlife habitats in grasslands in the Valleys and Hills Region:

1. Perform mine reclamation
2. Restore habitats and natural systems in grasslands
3. Acquire currently unprotected grasslands
4. Reduce conversion to cropland
5. Promote diversity of grassland types and successional stages
6. Preserve currently existing corridors
7. Acquire conservation easements to protect important wildlife habitats
8. Reduce loss of fish and wildlife habitats (due to agriculture, urban sprawl, commercial development, etc.)
9. Re-establish natural disturbance regimes in grasslands

Wetlands

Wetlands are defined as either ephemeral or permanently flooded habitat. Examples of wetlands include: swamps, marshes, bogs, fens, potholes, wetlands of farmed areas, and mudflats.

Top threats to SGCN occurring in wetlands in the Valleys and Hills Region:*

1. Invasive and alien species
2. Natural habitat conversion
3. Conversion of habitat to annual crops
4. Annual and perennial non-timber crops
5. Dams and water management and use

Top conservation actions for SGCN occurring in wetlands in the Valleys and Hills Region:

1. Protect and maintain large wetlands complexes
2. Restore wetlands
3. Control invasive plants in wetlands
4. Preserve and restore bottomland hardwood forests and floodplain swamps
5. Expand floodplain and upland habitat with multiple wetlands
6. In some cases, actively manage water levels (e.g., Black Tern, Common Gallinule)
7. Enroll lands in Wetlands Reserve Program (WRP)
8. Mitigate road hazards to amphibians and reptiles when roads cross over wetlands
9. Manage for high-diversity marshes
10. Provide stopover and roosting habitat for cranes

Top threats to fish and wildlife habitats in wetlands in the Valleys and Hills Region:

1. Conversion of habitat to annual crops
2. Invasive and alien species
3. Conversion of natural habitats to other land uses
4. Fossil fuel energy production
5. Housing and urban areas
6. Agriculture, residential, and forestry effluents
7. Mining and quarrying
8. Commercial and industrial areas
9. Point source pollution from commercial/industrial sources
10. Annual and perennial non-timber crops

Top conservation actions for fish and wildlife habitats in wetlands in the Valleys and Hills Region:

1. Reduce conversion to cropland
2. Acquire currently unprotected wetlands
3. Develop and promote farming technologies and practices that have conservation benefits (e.g., cover crops, no-till, and soil health)
4. Reduce loss of fish and wildlife habitats (due to agriculture, urban sprawl, commercial development, etc.)
5. Develop education programs specifically for K-12
6. Restore habitats and natural systems in wetlands
7. Increase compliance of existing rules and regulations for aquatic systems.
8. Promote diversity in wetlands
9. Preserve currently existing corridors
10. Acquire conservation easements to protect important wildlife habitats

E. INTERIOR PLATEAU REGION

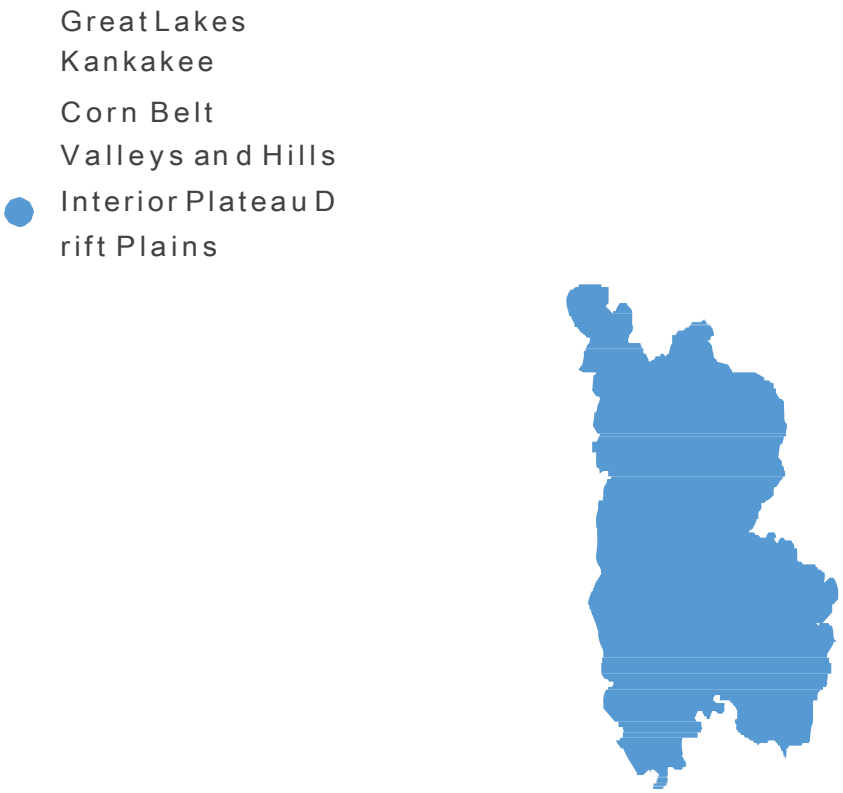


Figure 6-21. Outline of the Interior Plateau Region in Indiana for the SWAP.

Introduction

This section summarizes habitat conditions, threats to SGCN and their habitats, and conservation actions for species and habitats in the Interior Plateau Region. This section also reviews land cover changes over the past decade and identifies unique habitat types in this region. Summaries of threats to and conservation actions for SGCN and their habitats that were generated from two surveys can be found at the end of this section.

In addition to the threats and actions identified in the Habitat Survey and the Species Survey, the DFW recognized the need to identify threats aligned with specific actions. Several threats and actions were identified as ubiquitous across all sixregions. These include:

- **Habitat Loss:** Develop and promote farming technologies and practices that have conservation benefits (e.g., cover crops, no-till, and soilhealth)
- **Invasive Species:** Build external capacity (form and facilitate partnerships, alliances, and networks of organizations to address invasive species)
- **Law and Policy:** Develop, change, influence and help implement formal legislation, regulations and voluntary standards
- **Dams and Water Management and Use:** Remove unnecessary dams and utilize necessary dams with effective fish passage structures

The DFW also identified specific threats and actions for each SWAP region based on DFW priorities. These threats were identified due to their high level of relevancy to the specific region and the workability of the associated actions. These threats and actions for the Interior Plateau Region include:

- **Habitat Degradation to Karsts:** Restricting access
    - Education of landowners (e.g. sewer, trash, and recreational users)
    - Acquiring and managing lands to buffer karst features
- **Habitat Loss of Early Successional Forest:** Land management (e.g. timber cutting, fire, girdling, and mechanical and chemical treatments)
- **Habitat Degradation to Forests:** Controlling problematic native wildlife
    - Land management (e.g. timber cutting, fire, girdling, and mechanical and chemical treatments)

Current Habitat Conditions

During the Species Survey, respondents were asked to identify SGCN within the Interior Plateau Region. A full summary of the Species Survey results can be found in Appendix O.

Table 6-13: Species of Greatest Conservation Need present in the Interior Plateau Region.

Taxa	Scientific Name	Common Name
Amphibians	*Cryptobranchus alleganiensis*	Hellbender
Amphibians	*Necturus maculosus*	Common Mudpuppy
Amphibians	*Ambystoma barbouri*	Streamside Salamander
Amphibians	*Hemidactylium scutatum*	Four-toed Salamander
Amphibians	*Pseudotriton ruber*	Red Salamander
Amphibians	*Aneides aeneus*	Green Salamander
Amphibians	*Acris blanchardi*	Blanchard's Cricket Frog
Birds	*Cygnus buccinator*	Trumpeter Swan
Birds	*Colinus virginianus*	Northern Bobwhite
Birds	*Bonasa umbellus*	Ruffed Grouse
Birds	*Chordeiles minor*	Common Nighthawk
Birds	*Antrostomus vociferus*	Eastern Whip-poor-will
Birds	*Rallus elegans*	King Rail
Birds	*Gallinula galeata*	Common Gallinule
Birds	*Grus canadensis*	Sandhill Crane
Birds	*Grus americana*	Whooping Crane
Birds	*Pluvialis dominica*	American Golden-plover
Birds	*Charadrius melodus*	Piping Plover
Birds	*Bartramia longicauda*	Upland Sandpiper
Birds	*Arenaria interpres*	Ruddy Turnstone
Birds	*Calidris subruficollis*	Buff-breasted Sandpiper
Birds	*Limnodromus griseus*	Short-billed Dowitcher
Birds	*Scolopax minor*	American Woodcock
Birds	*Tringa solitaria*	Solitary Sandpiper
Birds	*Tringa melanoleuca*	Greater Yellowlegs
Birds	*Phalaropus tricolor*	Wilson's Phalarope
Birds	*Sternula antillarum athalassos*	Interior Least Tern
Birds	*Chlidonias niger*	Black Tern
Birds	*Botaurus lentiginosus*	American Bittern
Birds	*Ixobrychus exilis*	Least Bittern
Birds	*Ardea alba*	Great Egret
Birds	*Nycticorax nycticorax*	Black-crowned Night-heron
Birds	*Nyctanassa violacea*	Yellow-crowned Night-heron
Birds	*Pandion haliaetus*	Osprey

Taxa	Scientific Name	Common Name
Birds	*Ictinia mississippiensis*	Mississippi Kite
Birds	*Haliaeetus leucocephalus*	Bald Eagle
Birds	*Circus cyaneus*	Northern Harrier
Birds	*Accipiter striatus*	Sharp-shinned Hawk
Birds	*Buteo platypterus*	Broad-winged Hawk
Birds	*Tyto alba*	Barn Owl
Birds	*Asio flammeus*	Short-eared Owl
Birds	*Falco peregrinus*	Peregrine Falcon
Birds	*Lanius ludovicianus*	Loggerhead Shrike
Birds	*Cistothorus platensis*	Sedge Wren
Birds	*Cistothorus palustris*	Marsh Wren
Birds	*Ammodramus henslowii*	Henslow's Sparrow
Birds	*Xanthocephalus xanthocephalus*	Yellow-headed Blackbird
Birds	*Sturnella neglecta*	Western Meadowlark
Birds	*Helmitheros vermivorum*	Worm-eating Warbler
Birds	*Vermivora chrysoptera*	Golden-winged Warbler
Birds	*Mniotilta varia*	Black-and-white Warbler
Birds	*Setophaga citrina*	Hooded Warbler
Birds	*Setophaga cerulea*	Cerulean Warbler
Fish	*Acipenser fulvescens*	Lake Sturgeon
Fish	*Anguilla rostrata*	American Eel
Fish	*Hybopsis amnis*	Pallid Shiner
Fish	*Noturus stigmosus*	Northern Madtom
Fish	*Amblyopsis hoosieri*	Hoosier Cavefish
Fish	*Percina copelandi*	Channel Darter
Fish	*Ammocrypta clara*	Western Sand Darter
Fish	*Etheostoma maculatum*	Spotted Darter
Mammals	*Sorex fumeus*	Smoky Shrew
Mammals	*Sorex hoyi*	American Pygmy Shrew
Mammals	*Myotis austroriparius*	Southeastern Myotis
Mammals	*Myotis grisescens*	Gray Myotis
Mammals	*Myotis leibii*	Eastern Small-footed Myotis
Mammals	*Myotis lucifugus*	Little Brown Myotis
Mammals	*Myotis septentrionalis*	Northern Long-eared Myotis
Mammals	*Myotis sodalis*	Indiana Myotis
Mammals	*Lasionycteris noctivagans*	Silver-haired Bat
Mammals	*Perimyotis subflavus*	Tri-colored Bat
Mammals	*Nycticeius humeralis*	Evening Bat
Mammals	*Lasiurus borealis*	Eastern Red Bat
Mammals	*Lasiurus cinereus*	Hoary Bat
Mammals	*Corynorhinus rafinesquii*	Rafinesque's Big-eared Bat
Mammals	*Neotoma magister*	Allegheny Woodrat

Taxa	Scientific Name	Common Name
Mammals	*Ursus americanus*	Black Bear
Mammals	*Mustela nivalis*	Least Weasel
Mammals	*Taxidea taxus*	Badger
Mollusks	*Cyprogenia stegaria*	Fanshell
Mollusks	*Lampsilis fasciola*	Wavyrayed Lampmussel
Mollusks	*Obovaria subrotunda*	Round Hickorynut
Mollusks	*Plethobasus cyphyus*	Sheepnose
Mollusks	*Pleurobema cordatum*	Ohio Pigtoe
Mollusks	*Pleurobema plenum*	Rough Pigtoe
Mollusks	*Ptychobranchus fasciolaris*	Kidneyshell
Mollusks	*Simpsonaias ambigua*	Salamander Mussel
Mollusks	*Villosa lienosa*	Little Spectaclecase
Reptiles	*Macrochelys temminckii*	Alligator Snapping Turtle
Reptiles	*Terrapene carolina*	Eastern Box Turtle
Reptiles	*Pseudemys concinna*	River Cooter
Reptiles	*Thamnophis proximus*	Western Ribbonsnake
Reptiles	*Nerodia erythrogaster neglecta*	Copper-bellied Watersnake
Reptiles	*Clonophis kirtlandii*	Kirtland's Snake
Reptiles	*Opheodrys aestivus*	Rough Greensnake
Reptiles	*Cemophora coccinea*	Scarletsnake
Reptiles	*Tantilla coronata*	Southeastern Crowned Snake
Reptiles	*Agkistrodon piscivorus*	Cottonmouth
Reptiles	*Crotalus horridus*	Timber Rattlesnake

During the Habitat Survey, respondents were asked to evaluate the overall quality of fish and wildlife habitats in the Interior Plateau Region (Fig. 6-22), estimate changes in overall quality since 2005 (Fig. 6-23), and predict changes in overall quality over the next ten years (Fig. 6-24). Each respondent was asked to respond for one or more of the eight major habitat types within the region and results were aggregated at the regional level. A full list of the Habitat Survey results can be found in Appendix P.

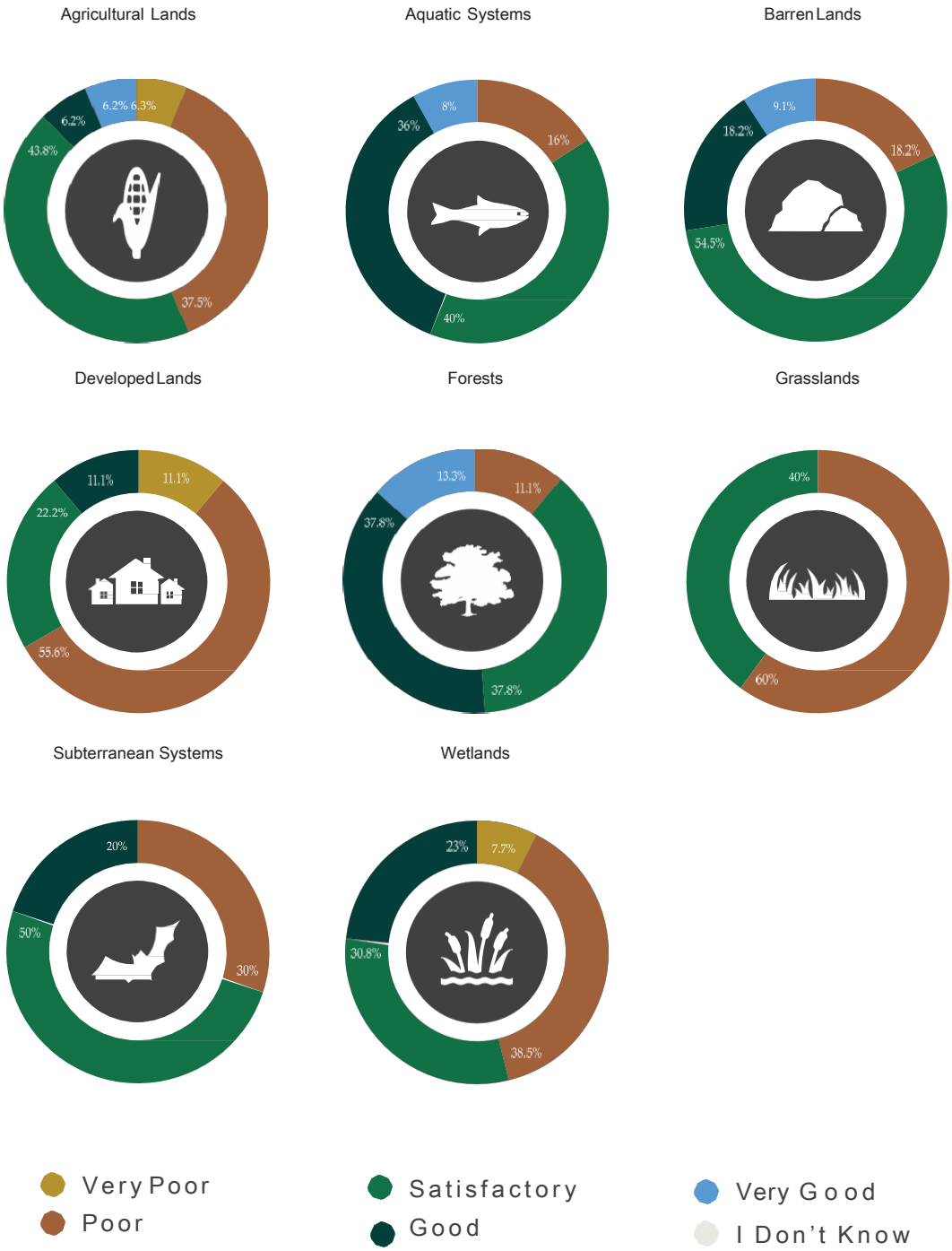


Figure 6-22. Overall quality of fish and wildlife habitats in the Interior Plateau Region in 2014.

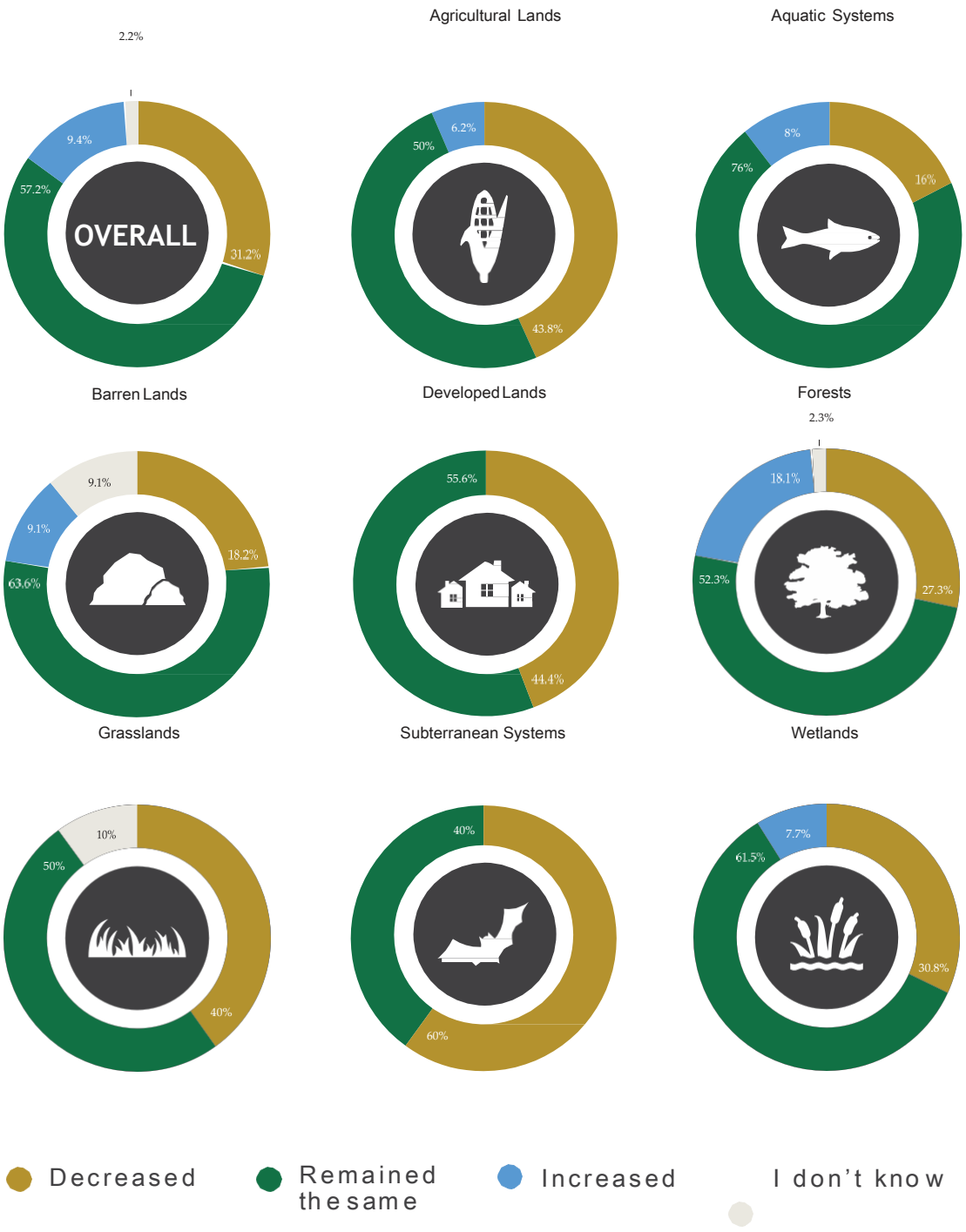


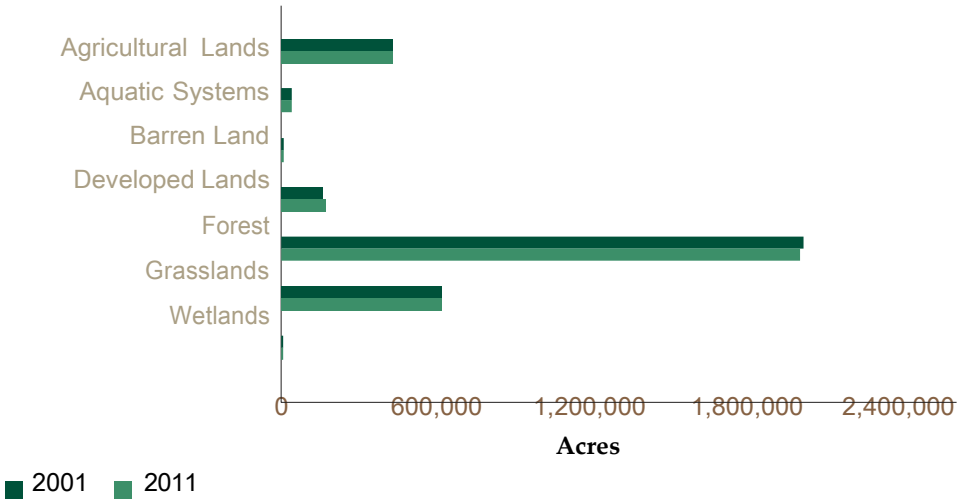
Figure 6-23. Estimated change in the overall quality of fish and wildlife habitats from 2005 to 2014 for each of the major habitat types in the Interior Plateau Region.

Figure 6-24. Predicted changes in overall quality of fish and wildlife habitats over the next ten years for each major habitat type in the Interior Plateau Region.

Changes in Land Cover

Unlike other regions of the state dominated by agriculture, most land cover in the Interior Plateau Region consists of forested land, followed by grasslands (Fig. 6-25). Compared to other Indiana regions, the Interior Plateau Region has the lowest percentage of agricultural lands at 13.1% and developed lands at 5.1%. It is the most forested region in the state and has the highest percentage of grasslands. The region is also home to most of Indiana's karst subterranean systems.

The Interior Plateau Region has experienced changes in habitat coverage over the past ten years. Aquatic systems, barren lands, developed lands, and wetlands increased, and agricultural lands, grasslands, and forests decreased. These habitats were mostly lost to urban development (Fig. 6-25). Percentage-wise, the greatest net losses were seen in forests (0.3%) and agricultural lands (0.2%). The greatest net increases were seen in barren lands (40.4%), wetlands (6.1%), and aquatic systems (4.6%).



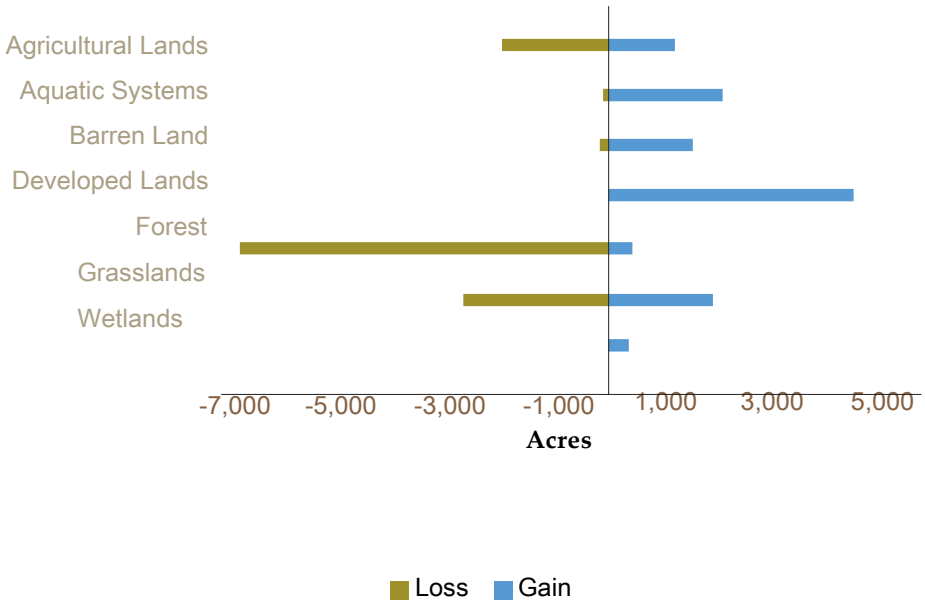


Figure 6-25. Distribution of land cover and losses and gains in land cover in the Interior Plateau Region between 2001 and 2011 from NLCD.

Threats Affecting Habitats

Top Threat Categories

The third element requires the description of threats to SGCN and their habitats. The SWAP identifies a habitat perspective in order to manage for the conservation of species in Indiana. This section utilizes the same hierarchical method of identifying and rating threats based on Salafsky et al. (2008) that was outlined in Chapter V. Category rankings and specific threat rankings for habitats in this region are outlined below (Table 6-14). A full summary of the Habitat Survey results for the Great Lakes Region can be found in Appendix P.

For first-level threat categories, both residential and commercial development and invasive and other problematic species were rated as significant to moderate threats, while the remaining categories were rated as moderate to minor threats. The invasive and other problematic species and genes category was identified as the top-ranking threat at the regional level. Invasive and alien species was rated as a significant to moderate specific second-level threat, receiving an average rating closer to significant for all habitat types.

Other specific threats in this category were only rated moderate to minor for the region. Residential and commercial development was rated highly for the region and first in developed lands and subterranean systems. Housing and urban areas was rated as the most significant threat for this region and was rated as a significant to moderate threat for the region. Respondents also wrote in free-response threats that connect to transportation and service corridors.

Agriculture and aquaculture received a mean rating very close to the significant to moderate threshold threat for the entire region. This category was additionally rated as the most significant for aquatic systems in the region. Conversion of habitat to annual crops was rated as a significant to moderate specific threat for the entire region. The pollution category also identified effluents from various sources, including agriculture, as the only significant to moderate threat within this category for the entire region.

Conversion of habitat was rated as the most significant threat within the natural systems modification category for the entire region. Human intrusion and disturbance and recreational activities within the human intrusion and disturbance category received moderate to minor threat ratings within this region.

Transportation and service corridors was rated as a more significant threat for forests and grasslands within this region. Roads and service corridors as a specific threat was rated as a significant to moderate threat for these habitat types. While other stressors, climate change and severe weather, energy production and mining, and biological resource use were rated as moderate to minor threat categories, each contained specific threats that were rated as significant to moderate across the entire region. Both specific threats in other direct stressors, diseases and genetic diversity, were rated in this top threat threshold; however, the diseases category

was consistently rated above low genetic diversity in terms of threat significance across all habitat types. All specific threats within climate change and severe weather were classified as significant to moderate for the entire region. Generally, changing frequency, duration, and intensity of drought and shifting and alteration of habitats due to climate change were identified as the top ranked threats for habitats in this region. Increased flooding because of climate change may be more of a concern in subterranean systems and wetlands.

Shale gas development was rated as the most significant threat across habitat types within energy production and mining. Other fossil fuel production may be more significant in aquatic systems, developed lands, and grasslands specifically. Mining and quarrying is the top rated threat in barren lands, subterranean systems, and wetlands.

Table 6-14. Threat category ranking to habitats in the Interior Plateau Region. First-level threat categories are based on the hierarchical method of identifying threats outlined in Salafsky et al. (2008). Ranked threat categories are arranged for the entire region by each major habitat type (1 - highest threat).

Category	Regional Ranking	Aquatic Systems	Agricultural Lands	Barren Lands	Developed Lands	Forests	Grasslands	Subterranean Systems	Wetlands
Invasive and Other Problematic Species and Genes	1	2	1	1	3	1	1	4	2
Residential and Commercial Development	2	3	2	2	1	2	2	1	3
Agriculture and Aquaculture	3	1	3	6	4	3	5	5	6
Pollution	4	4	7	7	2	9	7	2	1
Natural Systems Modification	5	5	4	3	5	8	9	7	4
Human Intrusion and Disturbance	6	6	6	4	6	6	6	3	5
Transportation and Service Corridors	7	7	5	10	8	4	3	6	7
Other Stressors	8	9	9	5	7	7	4	8	10
Climate Change and Severe Weather	9	8	11	8	10	5	10	10	9
Energy Production and Mining	10	10	8	9	9	10	8	9	8
Biological Resource Use	11	11	10	11	11	11	11	11	11

Top Specific Threats in Ranked Order

In the Habitat Survey, respondents were also asked to identify specific threats to major habitat types using the same threat category ranking system outlined in Salafsky et al. (2008). These second-level threats represent subcategories of threats within the major threat categories listed in the table above. The following are the top specific second-level threats to habitats in the Interior Plateau Region, aggregated across habitat types:

1. Invasive and alien species
2. Conversion of natural habitats to other land uses
3. Housing and urban areas
4. Conversion of habitat to annual crops
5. Agriculture, residential, and forestry effluents
6. Commercial and industrial areas
7. Household sewage and urban water waste
8. Runoff from roads and service corridors
9. Point source pollution from commercial and industrial sources
10. Annual and perennial non-timber crops

In the Species Survey, respondents were also asked to identify threats to individual SGCN using the same threat category ranking system. The following are the top specific second-level threats to SGCN occurring in the Interior Plateau Region, aggregated across all species:

1. Invasive and alien species
2. Natural habitat conversion
3. Housing and urban areas
4. Conversion of habitat to annual crops
5. Commercial and industrial areas
6. Annual and perennial non-timber crops
7. Dams and water management and use
8. Tourism and recreation areas
9. Recreation activities
10. Livestock farming and ranching

Emerging/Anticipated Threats

Respondents were asked specifically to identify any emerging or anticipated threats over the next ten years for fish and wildlife habitats within the major habitat types for a region in a free-response question.

For forests in this region, respondents identified as fragmentation, especially as a result of road development, invasion of forest pests, and escape of genetically modified pesticide resistant species as potential invaders as anticipated threats. Lack of management for early successional species, as well as changes in dominant species of forests impacting ecological communities are expected to threaten forest habitats in this region. There is growing concern about potential for other invasive plant and animal species as well. Expansion of feral swine

populations in the southern part of the state was listed as a potential threat by respondents in this region. Additionally, loss of funding for habitat conservation programs such as CRP were identified as a potential threat.

Conservation Actions Needed

Top Action Categories

The fourth element requires that the SWAP describe conservation actions proposed to conserve identified species and habitats as well as outlining priorities for their implementation. This section outlines conservation actions identified at the regional level for each of the major habitat types. This section follows the same protocol to rate and rank actions in this region based on Salafsky et al. (2008) that was outlined in Chapter V. A full list of survey results can be found in Appendix P. Category rankings for actions and specific actions are outlined in Table 6-15.

Land and water protection, land, water, and species management, education and awareness, and law and policy as categories received ratings, on average, between very and moderately important for this region. Livelihood, economic, and other incentives as well as external capacity received average ratings between moderately important and somewhat important. No category received a mean ranking between somewhat important and not important, indicating the identification of a variety of threats important to conservation of fish and wildlife habitats within this region.

Land and water protection was ranked first regionally and within all land types except for forests. Top actions within this category identified an importance to acquire currently unprotected habitats as well as preserve currently existing corridors between fish and wildlife habitats. Acquiring conservation easements and strengthening CRP partnerships were also ranked as most important for fish and wildlife habitats in grasslands and barren lands respectively.

Land, water, and species management was ranked second regionally, first in forests, and tied for first in agricultural lands. High-ranking actions in this region reflect a need to link habitat blocks, control invasive species, and restore natural systems in a variety of habitat types. Reducing loss of habitat was also identified as a high-ranking action regionally; it also ranked first in aquatic systems, agricultural lands, barren lands, developed lands, and forests within this category. Protecting adjacent buffer zones was also identified as the top ranking action for habitats within subterranean systems.

Education and awareness was ranked third regionally; however, education in general, educational programs for K-12, and training programs for stakeholders were, on average, rated between very important and moderately important. These three actions were ranked first for at least one habitat type within this region, indicating that a combination of them is likely necessary for comprehensive habitat conservation.

Using planning and zoning to reduce urban sprawl was the top ranking action regionally within law and policy. Increasing regulations on invasive species was also identified as the most important specific action for barren lands and forests. Respondents rated compliance and enforcement of current regulations above changing of policies in general but also suggested changes to regulations for sewage and installation of septic systems to benefit aquatic and subterranean

systems. Strengthening and enforcing mine reclamation regulations was also emphasized by respondents in the write-in section to be important for protecting fish and wildlife habitats in this region.

While livelihood, economic, and other incentives as well as external capacity building were ranked fifth and sixth regionally, all specific actions in this region were rated as very to moderately important or moderately to somewhat important. Developing both nonmonetary valuation and promoting conservation payments were identified as the highest ranking specific action for habitat types in livelihood, economic, and other incentives in this region. Strengthening conservation financing was also identified as important regionally and within habitat types, as well as promotion of use of research for decision-making for habitat within agricultural lands and development of partnerships and alliances, specifically for forests and wetlands.

Table 6-15. Action category ranking to habitats in the Interior Plateau Region. First-level categories are based on the hierarchical method of identifying actions outlined in Salafsky et al. (2008). Ranked action categories are arranged for the entire region by each major habitat type. (1 - highest threat).

Category	Regional Ranking	Aquatic Systems	Agricultural Lands	Barren Lands	Developed Lands	Forests	Grasslands	Subterranean Systems	Wetlands
Land/Water Protection	1	1	1	1	1	3	1	1	1
Land/Water/Species Management	2	2	1	2	2	1	2	3	2
Education and Awareness	3	3	4	4	3	2	3	2	3
Law and Policy	4	4	3	6	4	4	5	4	4
Livelihood, Economic, and Other Incentives	5	5	5	3	5	6	4	5	5
External Capacity Building	6	6	6	5	6	5	6	6	6
	Indicates a tie within this habitat type								

Top Specific Actions in Ranked Order

In the Habitat Survey, respondents were also asked to identify specific actions for major habitat types using the same action category ranking system outlined in Salafsky et al. (2008). These second-level actions represent subcategories of actions within the major action categories listed in the table above.

The following are the top specific second-level conservation actions for habitats in the Interior Plateau Region, aggregated across habitat types:

1. Reduce loss of fish and wildlife habitats (due to agriculture, urban sprawl, commercial development, etc.)
2. Develop education programs specifically for K-12
3. Preserve currently existing corridors
4. Develop educational programs in general
5. Reduce urban sprawl through planning and zoning
6. Acquire conservation easements to protect important wildlife habitats
7. Increase regulations on invasive species
8. Establish training programs for stakeholders
9. Reduce conversion to cropland
10. Improve compliance with and enforcement of current policies

The following are top actions for SGCN occurring for the Interior Plateau Region, as summarized from the free-response questions about conservation actions for individual species:

1. Educate and engage with landowners and citizens (especially bat ecology and issues)
2. Implement agricultural practices that improve water quality
3. Control invasive plants
4. Protect subterranean systems and limit recreational caving
5. Enhance connectivity of habitats
6. Protect large contiguous forested areas and reduce forest fragmentation
7. Use burning and mowing as management techniques in grasslands
8. Protect and manage large wetland complexes
9. Implement best management practices in forestry
10. Protect and restore riparian buffer zones

Prioritization of Actions

In order to prioritize these actions within an environment of limited resources, respondents were then asked to distribute hypothetical "effort points" to any action they had previously rated as "very important" for any of the major habitat types within a region. The effort ratings were averaged and then ranked to identify the top five actions for each region. A full list of these results can be found in Appendix P. Priority actions for the Interior Plateau Region include:

1. Reduce loss of fish and wildlife habitats (due to agriculture, urban sprawl, commercial development, etc.)
2. Control invasive species in forests
3. Reduce conversion to cropland
4. Strengthen conservation financing
5. Acquire currently unprotected forests

Overall, land, water, and species management actions like reducing loss of habitat, controlling invasive species, and reducing conversion to cropland were identified as priority actions in this region and reflect an identification of invasive species, development, and agriculture as high-ranking threat categories within this region. Respondents also prioritized an emphasis on forest habitat protection in land/water protection as well as strengthening conservation financing in order to facilitate the successful implementation of these land-based actions.

Threats and Actions by Major Habitat Type

The following summaries break down threats and conservation actions in this region by major habitat type, based on responses to the Habitat Survey and the Species Survey. The SGCN that occur there, top threats to SGCN, top actions for SGCN, key threats to habitats, and priority actions for each major habitat type in this region are summarized below.

Threats and actions were only included in detail below if a majority of eligible survey respondents, greater than 50%, rated them, to avoid artificially elevating items, which were highly ranked but only by a few respondents. This approach left some threats and action lists with no items for certain habitats, which is illogical from a practical perspective. Therefore, in these situations, the top threats and actions are still listed but are denoted with an asterisk (*) to signify that there may be some items, which seem out-of-place, reflecting a lack of sufficient response for a particular habitat in the survey. This approach and the survey design also caused for some disparities between threats and actions.

Approximately ten items are given for each list below. Lists may be shorter if fewer than ten items were rated by a majority of survey respondents, or longer if there were tires between items.

Top actions for SGCN were summarized from free-response questions about individual species and do not follow the same categorizations as actions for habitats. A full summary of the Habitat Survey responses can be found in Appendix P.

Agricultural Lands

Agricultural lands are defined as lands devoted to commodity production. Examples of agricultural lands include: intensively managed non-native grasses, row crops, fruit and nut-bearing trees, confined feeding operations, and feedlots.

Top threats to SGCN occurring in agricultural lands in the Interior Plateau Region:

1. Conversion of habitat to annual crops
2. Annual and perennial non-timber crops

Top conservation actions for SGCN occurring in agricultural lands in the Interior Plateau Region:

1. Educate and engage with landowners and citizens (benefits all species)
2. Reduce conversion of farmland to development
3. Increase use of CRP partnerships
4. Implement agricultural practices that improve water quality
5. Maintain shallow-water areas for migrating shorebirds
6. Provide incentives to farmers to increase landowner participation

Top threats to fish and wildlife habitats in agricultural lands in the Interior Plateau Region:

1. Conversion of natural habitats to other land uses
2. Invasive and alien species
3. Housing and urban areas
4. Conversion of habitat to annual crops
5. Commercial and industrial areas
6. Air pollution
7. Roads and railroads
8. Runoff from roads and service corridors
9. Agriculture, residential, and forestry effluents

Top conservation actions for fish and wildlife habitats in agricultural lands in the Interior Plateau Region:

1. Reduce loss of fish and wildlife habitats (due to agriculture, urban sprawl, commercial development, etc.)
2. Promote use of research and science in conservation decision-making processes
3. Preserve currently existing corridors
4. Reduce conversion to cropland
5. Develop and promote farming technologies and practices that have conservation benefits (e.g., cover crops, no-till, and soil health)
6. Link existing habitat blocks through corridor enhancement in agricultural lands
7. Restore and integrate diversity of habitats into crop-production dominated landscapes
8. Acquire conservation easements to protect important wildlife habitats
9. Increase regulations on invasive species
10. Reduce urban sprawl through planning and zoning

Aquatic Systems

Aquatic systems are defined as all water habitats, both flowing and stationary. Examples of aquatic systems include: manmade impoundments, natural lakes rivers, streams, oxbows, sloughs, embayments, and backwaters (not including wetlands).

Top threats to SGCN occurring in aquatic systems in the Interior Plateau Region:

1. Natural habitat conversion
2. Conversion of habitat to annual crops
3. Dams and water management and use
4. Annual and perennial non-timber crops
5. Livestock farming and ranching

Top conservation actions for SGCN occurring in aquatic systems in the Interior Plateau Region:

1. Enhance public, stakeholder, and landowner education and awareness
2. Implement agricultural best management practices to improve water quality
3. Protect and restore riparian buffer zones
4. Reduce sediment and nutrient loads
5. Reduce point and non-point source pollution
6. Remove dams
7. Clean polluted areas
8. Reduce recreational overuse
9. Restore floodplains
10. Reduce bank erosion
11. Limit bycatch of Hellbenders
12. Prohibit take of mussels

Top threats to fish and wildlife habitats in aquatic systems in the Interior Plateau Region:

1. Conversion of natural habitats to other land uses
2. Invasive and alien species
3. Agriculture, residential, and forestry effluents
4. Household sewage and urban water waste
5. Changing frequency, duration, and intensity of drought
6. Point source pollution from commercial and industrial sources
7. Conversion of habitat to annual crops
8. Dams and water management and use
9. Runoff from roads and service corridors
10. Changing frequency, duration, and intensity of floods

Top conservation actions for fish and wildlife habitats in aquatic systems in the Interior Plateau Region:

1. Reduce loss of fish and wildlife habitats (due to agriculture, urban sprawl, commercial development, etc.)
2. Develop education programs in general
3. Develop and promote farming technologies and practices that have conservation benefits (e.g., cover crops, no-till, and soil health)
4. Reduce nutrient and toxin loads (e.g., heavy metals, pharmaceuticals, fertilizers, insecticides)
5. Preserve currently existing corridors
6. Develop education programs specifically for K-12
7. Establish training programs for stakeholders
8. Strengthen conservation financing
9. Improve compliance with and enforcement of current policies
10. Acquire conservation easements to protect important wildlife habitats

Barren Lands

Barren lands are defined as lands dominated by exposed rock or minerals with sparse vegetation. Examples of barren lands include: sand/dunes, rock outcrops, cliffs, and bare rock.

Top threats to SGCN occurring in barren lands in the Interior Plateau Region:*

1. Natural habitat conversion
2. Housing and urban areas
3. Conversion of habitat to annual crops
4. Tourism and recreation areas
5. Recreation activities
6. Dams and water management and use

Top conservation actions for SGCN occurring in barren lands in the Interior Plateau Region:

1. Educate public about Peregrine Falcon
2. Protect Bald Eagle nest sites
3. Protect rocky cliff habitat for the Eastern Small-footed Myotis and Green Salamander
4. Establish corridors between Allegheny Woodrat habitat

Top threats to fish and wildlife habitats in barren lands in the Interior Plateau Region:

1. Invasive and alien species
2. Problematic native species (e.g. overabundant native deer or algae)
3. Plant diseases
4. Housing and urban areas
5. Commercial and industrial areas

Top conservation actions for fish and wildlife habitats in barren lands in the Interior Plateau Region:

1. Establish training programs for stakeholders
2. Promote conservation payment programs (e.g., payment for ecosystem services, conservation easements)
3. Promote nonmonetary values of natural systems within the state
4. Manage recreational opportunities to be compatible with fish and wildlife habitats
5. Link existing habitat blocks through corridor enhancement in barren lands
6. Protect adjacent buffer zones
7. Re-establish natural disturbance regimes in barren lands
8. Restore habitats and natural systems in barren lands
9. Develop education programs specifically for K-12

Developed Lands

Developed lands are defined as highly impacted lands intensively modified to support human habitation, transportation, commerce, and recreation. Examples of developed lands include: urban lands, suburban lands, industrial areas, commercial areas, towers for communication and wind power generation, and recreational areas such as golf courses and soccer fields.

Top threats to SGCN occurring in developed lands in the Interior Plateau Region:*

1. Renewable energy production
2. Invasive and alien species
3. Diseases from domestic populations and unknown sources
4. Fossil fuel energy production
5. Mining and quarrying

Top conservation actions for SGCN occurring in developed lands in the Interior Plateau Region:

1. Public education and awareness regarding bat ecology and issues
2. Reduce urban sprawl and commercial property expansion
3. Manage urban areas for Peregrine Falcons; minimize disturbance during nesting
4. Increase gravel-surfaced rooftop habitat for breeding Common Nighthawks
5. Mitigate road hazards for wildlife
6. Limit mowing along roads

Top threats to fish and wildlife habitats in developed lands in the Interior Plateau Region:

1. Invasive and alien species
2. Conversion of natural habitats to other land uses
3. Conversion of habitat to annual crops
4. Housing and urban areas
5. Commercial and industrial areas
6. Problematic native species
7. Recreation activities (e.g., ATVs, trail use, horseback riding, high-speed boating, canoeing)
8. Plant diseases
9. Garbage and solid waste
10. Household sewage and urban water waste

Top conservation actions for fish and wildlife habitats in developed lands in the Interior Plateau Region:

1. Preserve currently existing corridors
2. Reduce loss of fish and wildlife habitats (due to agriculture, urban sprawl, commercial development, etc.)
3. Reduce urban sprawl through planning and zoning
4. Reduce nutrient and toxin loads
5. Restore and integrate diversity of habitats into developed landscapes
6. Increase acres enrolled in the Classified Forest and Wildlands Program
7. Develop education programs in general
8. Develop education programs specifically for K-12
9. Increase regulations on invasive species
10. Set private sector standards and codes

Forests

Forests are defined as a plant community dominated by trees. Examples of forests include, but are not limited to, all stages of natural forest and plantations.

Top threats to SGCN occurring in forests in the Interior Plateau Region:*

1. Housing and urban areas
2. Natural habitat conversion
3. Invasive and alien species
4. Commercial and industrial areas
5. Diseases from domestic populations and unknown sources
6. Tourism and recreation areas
7. Problematic native species
8. Over-mowing of natural areas

Top conservation actions for SGCN occurring in forests in the Interior Plateau Region:

1. Protect large contiguous forested areas and reduce forest fragmentation
2. Limit conversion of forests to non-forest land uses
3. Control invasive woody plants in the understory
4. Reduce development in forested areas
5. Protect roost trees for bat species
6. Restore forests and woodlands
7. Create small forest openings to increase diversity
8. Implement best management practices in forestry
9. Re-establish bottomland hardwood forests
10. Manage forests adjacent to rocky habitat
11. Manage for healthy forest edge habitats

Top threats to fish and wildlife habitats in forests in the Interior Plateau Region:

1. Invasive and alien species
2. Conversion of natural habitats to other land uses
3. Housing and urban areas
4. Conversion of habitat to annual crops
5. Roads and railroads
6. Plant diseases
7. Problematic native species

Top conservation actions for fish and wildlife habitats in forests in the Interior Plateau Region:

1. Preserve currently existing corridors
2. Control invasive species in forests
3. Acquire currently unprotected forests
4. Acquire conservation easements to protect important wildlife habitats
5. Restore habitats and natural systems in forests
6. Increase regulations on invasive species
7. Promote diversity of forest types and successional stages
8. Reduce loss of fish and wildlife habitats (due to agriculture, urban sprawl, commercial development, etc.)
9. Reduce urban sprawl through planning and zoning
10. Develop education programs specifically for K-12

Grasslands

Grasslands are defined as an open area dominated by grass species. Examples of grasslands include: haylands, pasture, prairies, savannahs, or reclaimed mine lands.

Top threats to SGCN occurring in grasslands in the Interior Plateau Region:

1. Conversion of habitat to annual crops
2. Annual and perennial non-timber crops

Top conservation actions for SGCN occurring in grasslands in the Interior Plateau Region:

1. Restore and improve connectivity of grasslands
2. Maintain large tracts of grasslands
3. Reduce woody encroachment on grasslands
4. Increase CRP grasslands
5. Implement burning regimes
6. Minimize disturbance to nesting grassland birds (e.g., Henslow's Sparrow)
7. Mow properly (reduce mowing for shorebirds and owls)
8. Acquire conservation easements.
9. Improve grazing practices
10. Protect low, wet fields, and meadows

Top threats to fish and wildlife habitats in grasslands in the Interior Plateau Region:

1. Housing and urban areas
2. Commercial and industrial areas
3. Conversion of habitat to annual crops
4. Roads and railroads
5. Invasive and alien species
6. Annual and perennial non-timber crops
7. Livestock farming and ranching

Top conservation actions for fish and wildlife habitats in grasslands in the Interior Plateau Region:

1. Reduce urban sprawl through planning and zoning
2. Reduce loss of fish and wildlife habitats (due to agriculture, urban sprawl, commercial development, etc.)
3. Develop education programs in general
4. Develop education programs specifically for K-12
5. Acquire currently unprotected grasslands
6. Acquire conservation easements to protect important wildlife habitats
7. Re-establish natural disturbance regimes in grasslands
8. Restore habitats and natural systems in grasslands
9. Set private sector standards and codes
10. Improve compliance with and enforcement of current policies
11. Promote conservation payment programs (e.g., payment for ecosystem services, conservation easements)

Subterranean Systems

Subterranean systems are defined as connecting underground rooms and passages beyond natural light penetration. Examples of subterranean systems include: underground waters, above and below the water table, and terrestrial air-filled habitats ranging from large caves to interstitial crevices below soil horizons.

Top Threats to SGCN Occurring in Subterranean Systems in the Interior Plateau Region:

1. Invasive and alien species

Top conservation actions for SGCN occurring in subterranean systems in the Interior Plateau Region:

1. Protect subterranean systems
2. Limit recreational caving
3. Protect bat hibernacula

Top threats to fish and wildlife habitats in subterranean systems in the Interior Plateau Region:

1. Invasive and alien species
2. Runoff from roads and service corridors
3. Conversion of natural habitats to other land uses
4. Agriculture, residential, and forestry effluents
5. Housing and urban areas
6. Commercial and industrial areas
7. Roads and railroads
8. Chemical spills
9. Household sewage and urban water waste

Top conservation actions for fish and wildlife habitats in subterranean systems in the Interior Plateau Region:

1. Develop education programs specifically for K-12
2. Protect adjacent buffer zones
3. Acquire currently unprotected subterranean systems
4. Develop education programs in general
5. Control invasive species in subterranean systems
6. Reduce loss of fish and wildlife habitats (due to agriculture, urban sprawl, commercial development, etc.)
7. Acquire conservation easements
8. Strengthen conservation financing
9. Reduce nutrient and toxin loads
10. Promote nonmonetary values of natural systems within the state

Wetlands

Wetlands are defined as either ephemeral or permanently flooded habitat. Examples of wetlands include: swamps, marshes, bogs, fens, potholes, wetlands of farmed areas, and mudflats.

Top threats to SGCN occurring in wetlands in the Interior Plateau Region:

1. Invasive and alien species
2. Natural habitat conversion
3. Conversion of habitat to annual crops
4. Annual and perennial non-timber crops
5. Dams and water management and use

Top conservation actions for SGCN occurring in wetlands in the Interior Plateau Region:

1. Protect and maintain large wetlands complexes
2. Restore wetlands
3. Improve water quality
4. Protect buffers around wetlands
5. Control invasive plants in wetlands
6. Mitigate road hazards to amphibians and reptiles when roads cross over wetlands
7. Minimize disturbance to nesting turtles
8. Provide stopover and roosting habitat for cranes and shorebirds
9. Conserve ephemeral wetlands
10. Connect wetlands with surrounding upland habitat

Top threats to fish and wildlife habitats in wetlands in the Interior Plateau Region:

1. Conversion of natural habitats to other land uses
2. Invasive and alien species
3. Housing and urban areas
4. Commercial and industrial areas
5. Conversion of habitat to annual crops
6. Point source pollution from commercial and industrial sources
7. Annual and perennial non-timber crops
8. Air pollution
9. Agriculture, residential, and forestry effluents

Top conservation actions for fish and wildlife habitats in wetlands in the Interior Plateau Region:

1. Acquire currently unprotected wetlands
2. Reduce urban sprawl through planning and zoning
3. Restore habitats and natural systems in wetlands
4. Develop education programs specifically for K-12
5. Improve compliance with and enforcement of current policies
6. Reduce conversion to cropland
7. Develop and promote farming technologies and practices that have conservation benefits (e.g., cover crops, no-till, and soil health)
8. Improve drainage management
9. Protect adjacent buffer zones
10. Preserve currently existing corridors

F. DRIFT PLAINS REGION

Great Lakes
Kankakee
Corn Belt
Valleys and Hills
Interior Plateau
Drift Plains

Figure 6-26. Outline of the Drift Plains Region in Indiana for the SWAP.

Introduction

This section summarizes habitat conditions, threats to SGCN and their habitats, and conservation actions for species and habitats in the Drift Plains Region. This section also reviews land cover changes over the past decade and identifies unique habitat types in this region. Summaries of threats to and conservation actions for SGCN and their habitats that were generated from two surveys can be found at the end of this section.

In addition to the threats and actions identified in the Habitat Survey and the Species Survey, the DFW recognized the need to identify threats aligned with specific actions. Several threats and actions were identified as ubiquitous across all sixregions. These include:

- **Habitat Loss:** Develop and promote farming technologies and practices that have conservation benefits (e.g., cover crops, no-till, and soilhealth)
- **Invasive Species:** Build external capacity (form and facilitate partnerships, alliances, and networks of organizations to address invasive species)
- **Law and Policy:** Develop, change, influence and help implement formal legislation, regulations and voluntary standards
- **Dams and Water Management and Use:** Remove unnecessary dams and utilize necessary dams with effective fish passage structures

The DFW also identified specific threats and actions for each SWAP region based on DFW priorities. These threats were identified due to their high level of relevancy to the specific region and the workability of the associated actions. These threats and actions for the Drift Plains Region include:

- **Habitat Loss of Barren Lands and Glades:** Build external capacity by forming partnerships and networks, raising and providing funds and resources for conservation organizations to maintain and protect barren lands and glades
    - Land management (e.g., timber cutting, fire, girdling, and mechanical and chemical treatments
- **Habitat Loss of Wetlands:** Build external capacity by forming partnerships and networks, raising and providing funds and resources for conservation organizations to maintain and protect wetlands

Current Habitat Conditions

During the Species Survey, respondents were asked to identify SGCN within the Drift Plains Region. A full summary of the Species Survey results can be found in Appendix O.

Table 6-16. Species of Great Conservation Need present in the Drift Plains Region.

Taxa	Scientific Name	Common Name
Amphibians	*Necturus maculosus*	Common Mudpuppy
Amphibians	*Ambystoma barbouri*	Streamside Salamander
Amphibians	*Hemidactylium scutatum*	Four-toed Salamander
Amphibians	*Acris blanchardi*	Blanchard's Cricket Frog
Amphibians	*Lithobates areolatus*	Crawfish Frog
Birds	*Cygnus buccinator*	Trumpeter Swan
Birds	*Colinus virginianus*	Northern Bobwhite
Birds	*Bonasa umbellus*	Ruffed Grouse
Birds	*Chordeiles minor*	Common Nighthawk
Birds	*Antrostomus vociferus*	Eastern Whip-poor-will
Birds	*Rallus elegans*	King Rail
Birds	*Gallinula galeata*	Common Gallinule
Birds	*Grus canadensis*	Sandhill Crane
Birds	*Grus americana*	Whooping Crane
Birds	*Pluvialis dominica*	American Golden-plover
Birds	*Charadrius melodus*	Piping Plover
Birds	*Bartramia longicauda*	Upland Sandpiper
Birds	*Arenaria interpres*	Ruddy Turnstone
Birds	*Calidris subruficollis*	Buff-breasted Sandpiper
Birds	*Limnodromus griseus*	Short-billed Dowitcher
Birds	*Scolopax minor*	American Woodcock
Birds	*Tringa solitaria*	Solitary Sandpiper
Birds	*Tringa melanoleuca*	Greater Yellowlegs
Birds	*Phalaropus tricolor*	Wilson's Phalarope
Birds	*Sternula antillarum athalassos*	Interior Least Tern
Birds	*Chlidonias niger*	Black Tern
Birds	*Botaurus lentiginosus*	American Bittern
Birds	*Ixobrychus exilis*	Least Bittern
Birds	*Ardea alba*	Great Egret
Birds	*Nycticorax nycticorax*	Black-crowned Night-heron
Birds	*Nyctanassa violacea*	Yellow-crowned Night-heron
Birds	*Pandion haliaetus*	Osprey
Birds	*Ictinia mississippiensis*	Mississippi Kite

Taxa	Scientific Name	Common Name
Birds	*Haliaeetus leucocephalus*	Bald Eagle
Birds	*Circus cyaneus*	Northern Harrier
Birds	*Accipiter striatus*	Sharp-shinned Hawk
Birds	*Buteo platypterus*	Broad-winged Hawk
Birds	*Tyto alba*	Barn Owl
Birds	*Asio flammeus*	Short-eared Owl
Birds	*Falco peregrinus*	Peregrine Falcon
Birds	*Lanius ludovicianus*	Loggerhead Shrike
Birds	*Cistothorus platensis*	Sedge Wren
Birds	*Cistothorus palustris*	Marsh Wren
Birds	*Ammodramus henslowii*	Henslow's Sparrow
Birds	*Xanthocephalus xanthocephalus*	Yellow-headed Blackbird
Birds	*Helmitheros vermivorum*	Worm-eating Warbler
Birds	*Vermivora chrysoptera*	Golden-winged Warbler
Birds	*Mniotilta varia*	Black-and-white Warbler
Birds	*Setophaga citrina*	Hooded Warbler
Birds	*Setophaga cerulea*	Cerulean Warbler
Fish	*Anguilla rostrata*	American Eel
Fish	*Noturus stigmosus*	Northern Madtom
Fish	*Etheostoma variatum*	Variegate Darter
Fish	*Percina copelandi*	Channel Darter
Fish	*Percopsis omiscomaycus*	Trout-perch
Mammals	*Sorex hoyi*	American Pygmy Shrew
Mammals	*Myotis grisescens*	Gray Myotis
Mammals	*Myotis lucifugus*	Little Brown Myotis
Mammals	*Myotis septentrionalis*	Northern Long-eared Myotis
Mammals	*Myotis sodalis*	Indiana Myotis
Mammals	*Lasionycteris noctivagans*	Silver-haired Bat
Mammals	*Perimyotis subflavus*	Tri-colored Bat
Mammals	*Nycticeius humeralis*	Evening Bat
Mammals	*Lasiurus borealis*	Eastern Red Bat
Mammals	*Lasiurus cinereus*	Hoary Bat
Mammals	*Corynorhinus rafinesquii*	Rafinesque's Big-eared Bat
Mammals	*Ursus americanus*	Black Bear
Mammals	*Mustela nivalis*	Least Weasel
Mammals	*Taxidea taxus*	American Badger
Mollusks	*Plethobasus cyphyus*	Sheepnose
Mollusks	*Pleurobema cordatum*	Ohio Pigtoe
Mollusks	*Ptychobranchus fasciolaris*	Kidneyshell
Mollusks	*Simpsonaias ambigua*	Salamander Mussel
Mollusks	*Toxolasma lividum*	Purple Lilliput
Mollusks	*Villosa lienosa*	Little Spectaclecase

Taxa	Scientific Name	Common Name
Reptiles	*Terrapene carolina*	Eastern Box Turtle
Reptiles	*Nerodia erythrogaster neglecta*	Copper-bellied Watersnake
Reptiles	*Clonophis kirtlandii*	Kirtland's Snake
Reptiles	*Opheodrys aestivus*	Rough Greensnake
Reptiles	*Cemophora coccinea*	Scarletsnake
Reptiles	*Tantilla coronata*	Southeastern Crowned Snake
Reptiles	*Crotalus horridus*	Timber Rattlesnake

During the Habitat Survey, respondents were asked to evaluate the overall quality of fish and wildlife habitats in the Drift Plains Region (Fig. 6-27), estimate changes in overall quality since 2005 (Fig. 6-28), and predict changes in overall quality over the next ten years (Fig. 6-29). Each respondent was asked to respond for one or more of the eight major habitat types within the region and results were aggregated at the regional level. A full list of the Habitat Survey results can be found in Appendix P.

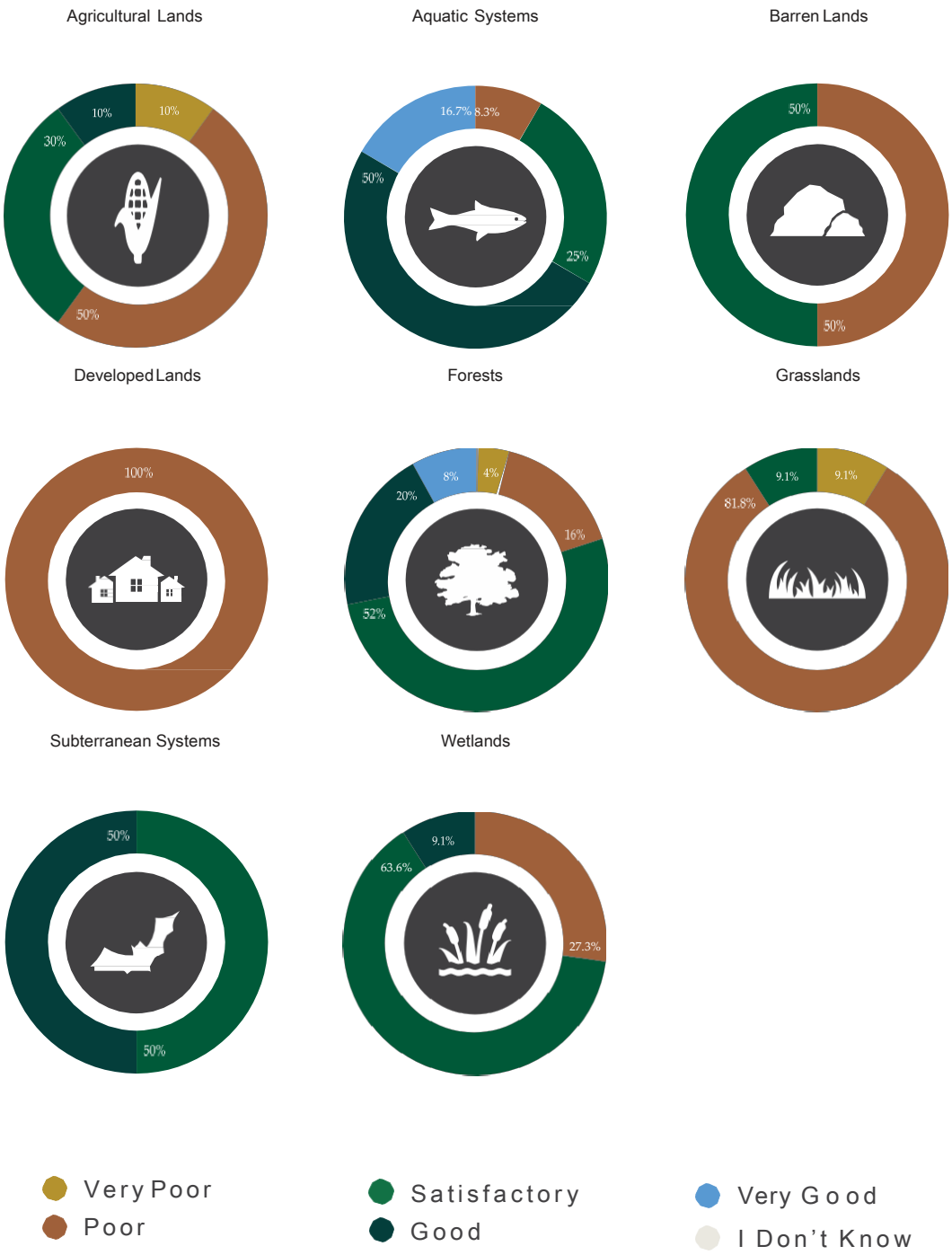


Figure 6-27. Overall quality of fish and wildlife habitats in the Drift Plains Region in 2014.

Figure 6-28. Estimated change in the overall quality of fish and wildlife habitats from 2005 to 2014 for each of the major habitat types in the Drift Plains Region.

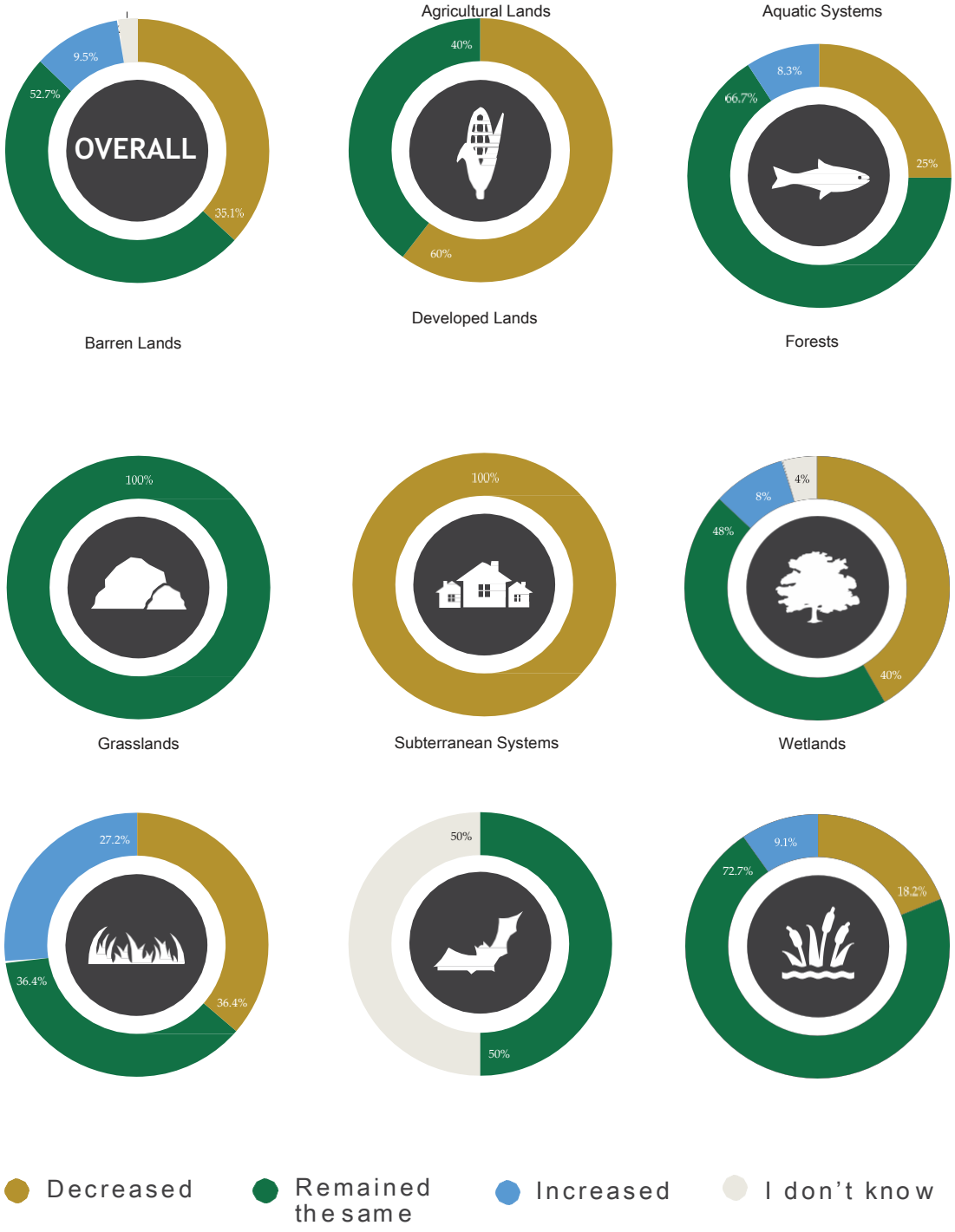
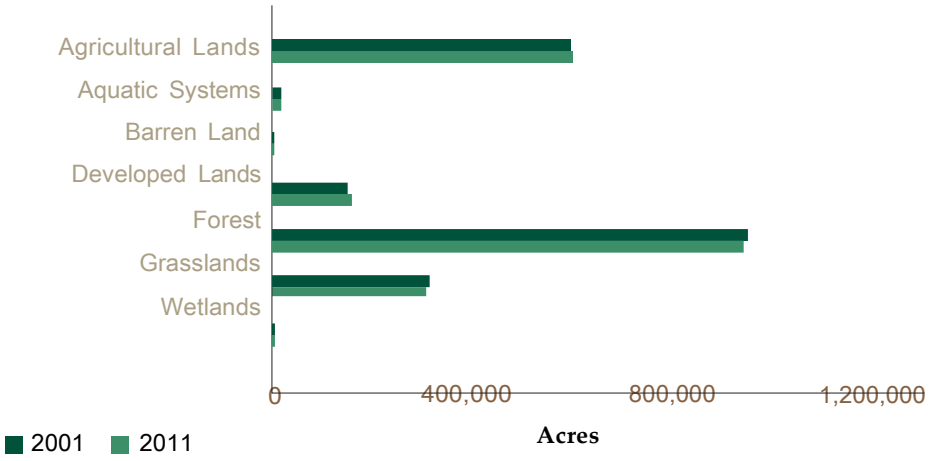


Figure 6-29. Predicted changes in overall quality of fish and wildlife habitats over the next ten years for each major habitat type in the Drift Plains Region.

Changes in Land Cover

Unlike other regions of the state, which are dominated by agricultural lands, most land cover in the Drift Plains Region consists of forested land, followed by agricultural lands and grasslands (Fig. 6-30). Compared to other Indiana regions, the Drift Plains Region has a relatively low percentage of developed lands. The region is also home to limited areas of Indiana's karst subterranean systems.

The Drift Plains Region has experienced changes in habitat coverage over the past ten years. Agricultural lands, aquatic systems, barren lands, developed lands, and wetlands increased while forests and grasslands decreased. These habitats were mostly lost to urban development (Fig. 6-30). Percentage-wise, the greatest net losses were seen in grasslands (1.3%) and forests (0.6%). The greatest net increases were seen in wetlands (59.6%), barren lands (23.6%), and aquatic systems (4.4%). Comprising of only .03% of the total land cover in the region, these habitat types were not abundant to begin with.



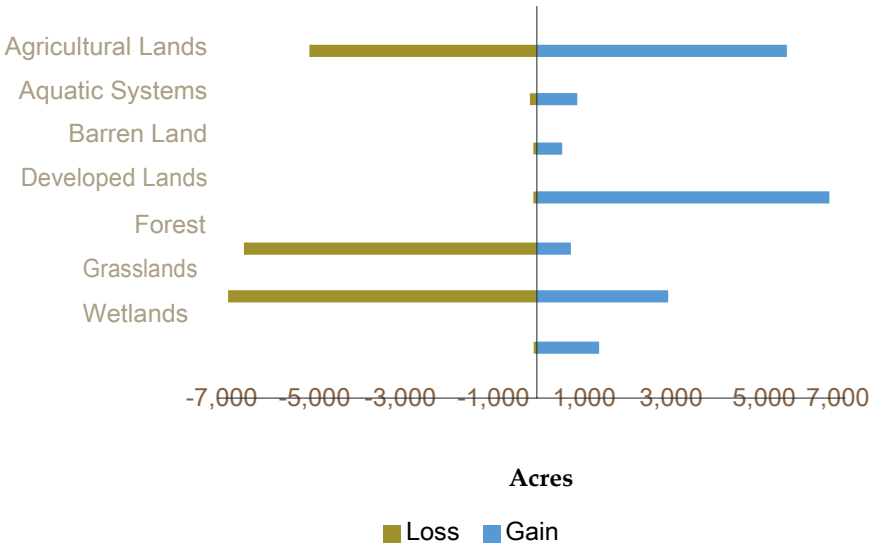


Figure 6-30. Distribution of land cover and losses and gains in land cover in the Drift Plains Region between 2001 and 2011 from NLCD.

Threats Affecting Habitats

Top Threat Categories

The third element requires the description of threats to SGCN and their habitats. The SWAP identifies a habitat perspective in order to manage for the conservation of species in Indiana. This section utilizes the same hierarchical method of identifying and rating threats based on Salafsky et al. (2008) that was outlined in Chapter V. Category rankings and specific threat rankings for habitats in this region are outlined below (Table 6-17). A full summary of the Habitat Survey results for the Great Lakes Region can be found in Appendix P.

For first-level threat categories, all threat categories were rated either significant to moderate or moderate to minor for the region. Agriculture and aquaculture was identified as a significant threat to habitats within this region. Within this category, conversion of habitat to annual crops and annual and perennial non-timber crops were both, on average, rated as significant to moderate specific second-level threats.

Residential and commercial development was ranked highly across different major habitat types; invasive and other problematic species and genes were also rated highly across categories. Invasive and alien species received a mean threat rating between significant and moderate, while other specific threats in this category were rated in the moderate to minor threat level for this region.

Categories ranked below invasive species received regional ratings of moderate-minor threats. Human intrusion and disturbance was ranked as the most significant threat category for barren lands, developed lands, and subterranean systems. Within barren lands and subterranean systems, recreational activities were rated as a significant to moderate threat. Natural system modification was rated as the top threat in wetlands. Within this category, natural habitat conversion was rated as a significant and moderate threat to wetlands.

Within the pollution category, the most significant threats identified were runoff from service corridors, agricultural and residential development, and forestry effluents and point source pollution. Both diseases and low genetic diversity were rated as significant to moderate threats within other stressors, another mid-ranked threat category to this region.

Energy production and mining, climate change and other severe weather, and biological resource use were on average rated closer to minor threats than moderate threats. However, within the climate change category, temperature extremes, shifting seasons, and changing frequency/duration of droughts were rated as significant to moderate specific threats within the region. Forestry practices were also rated as a significant to moderate threat across all habitat types and rated especially high in barren lands, grasslands, and wetlands.

Table 6-17. Threat category ranking to habitats in the Drift Plains Region. First-level threat categories are based on hierarchical method of identifying threats outlines in Salafsky et al. (2008). Ranked threat categories for the entire region are arranged by each major habitat type (1 - highest threat).

Category	Regional Ranking	Aquatic Systems	Agricultural Lands	Barren Lands	Developed Lands	Forests	Grasslands	Subterranean Systems	Wetlands
Agriculture and Aquaculture	1	1	1	3	8	3	1	6	2
Residential and Commercial Development	2	3	3	2	2	2	3	3	3
Invasive and Other Problematic Species and Genes	3	2	2	4	3	1	4	2	7
Human Intrusion and Disturbance	4	8	4	1	1	4	2	1	6
Natural Systems Modification	5	4	6	9	5	7	6	7	1
Pollution	6	5	5	5	6	6	7	4	5
Other Stressors	7	9	7	6	10	5	5	9	4
Transportation and Service Corridors	8	7	9	7	4	10	9	5	9
Energy Production and Mining	9	6	10	8	9	11	10	11	8
Climate Change and Severe Weather	10	10	8	11	11	9	11	8	10
Biological Resource Use	11	11	11	10	7	8	8	10	11

Top Specific Threats in Ranked Order

In the Habitat Survey, respondents were also asked to identify specific threats to major habitat types using the same threat category ranking system outlined in Salafsky et al. (2008). These second-level threats represent subcategories of threats within the major threat categories listed in the table above. The following are the top specific second-level threats to habitats in the Drift Plains Region, aggregated across habitat types:

1. Invasive and alien species
2. Conversion of habitat to annual crops
3. Conversion of natural habitats to other land uses
4. Housing and urban areas
5. Commercial and industrial areas
6. Recreation activities
7. Annual and perennial non-timber crops
8. Plant diseases
9. Problematic native species
10. Livestock farming and ranching

In the Species Survey, respondents were also asked to identify threats to individual SGCN using the same threat category ranking system. The following are the top specific (second-level) threats to SGCN occurring in the Drift Plains Region, aggregated across all species:

1. Natural habitat conversion
2. Invasive and alien species
3. Housing and urban areas
4. Conversion of habitat to annual crops
5. Commercial and industrial areas
6. Annual and perennial non-timber crops
7. Tourism and recreation areas
8. Recreation areas
9. Livestock farming and ranching

Emerging/Anticipated Threats

Respondents were asked specifically to identify any emerging or anticipated threats over the next ten years for fish and wildlife habitats within the major habitat types for a region in a free-response question.

In this region, respondents identified an emerging threat was a growing disconnect to natural resources, which might increase difficulty in sustaining public support for lands devoted to conservation. Other respondents identified more land-based threats like fragmentation and forest pests, such as the emerald ash borer.

Conservation Actions Needed

Top Action Categories

The fourth element requires that the SWAP describe conservation actions proposed to conserve identified species and habitats as well as outlining priorities for their implementation. This section outlines conservation actions identified at the regional level for each of the major habitat types. This section follows the same protocol to rate and rank actions in this region based on Salafsky et al. (2008) that was outlined in Chapter V. A full list of survey results can be found in Appendix P. Category rankings for actions and specific actions are outlined in the list on the following page (Table 6-18).

Regionally, land, water, andspecies management, educationandawareness, land and water protection, and livelihood, economic, and other incentives received average category ratings between very and moderately important. Law and policy and external capacity building were rated between moderately and somewhat important. No action category ranked in the somewhat to not important range, indicating the identification of a wide range and variety of specific actions important to conservation of habitats within the region.

Within land, water, and species management, approximately half of the specific actions were on average rated as very to moderately important regionally. Top-ranking actions identified a need to restore natural systems, promote a diversity of successional stages, and control invasive species in a variety of habitat types. Reducing loss of habitat was also ranked as the most important action in agricultural lands, barren lands, and developed lands while being highly ranked in the remaining habitat types. Species reintroduction was also identified as important in forests, grasslands, and wetlands, with respondents suggesting reintroduction of extirpated native species, native grasses, quail and other game birds, crawfish frog, elk, black bears, wolves, hellbenders, and threatened mussel species.

Education and awareness also ranked highly for this region. Education programs in general, education programs for K-12, and training programs for stakeholders all received mean ratings between very and moderately important for this region.

Land and water protection was ranked third regionally; every specific action except for acquiring currently unprotected barren lands was rated between very and moderately important. Important actions in this region reflects a need to acquire unprotected habitats and preserve currently existing corridors. Reducing conversion to cropland and strengthening CRP partnerships were also identified as the most important actions in multiple habitat types.

Livelihood, economic, and other incentives was ranked between very and moderately important as a category within this region. Promoting conservation payments was ranked fi regionally and within every habitat type within this category. Promoting nonmonetary values of natural systems and managing recreational opportunities to be compatible with fish and wildlife habitats were also both rated as very to moderately important specific actions within this category for this region.
Within law and policy, respondents identified an importance for regulations on invasive species and improving compliance and enforcement of current policies. Using zoning to reduce urban sprawl was ranked as the most important action for habitats in aquatic systems and developed lands. Changing current policy was rated between moderately to somewhat important, but respondents did suggest

policy changes to increase pollution control regulations, reducing turtle harvest, and wetland mitigation.

Promotion of research in conservation decision-making, developing alliances and partnerships, increasing state's capacity for research and monitoring of conservation actions, and strengthening conservation financing were all rated between very and moderately important within external capacity building for this region.

Table 6-18. Action category ranking to habitats in the Drift Plains Region. First-level categories are based on the hierarchical method of identifying actions outlined in Salafsky et al. (2008). Ranked actions for the entire region are arranged by each major habitat type.

Category	Regional Ranking	Aquatic Systems	Agricultural Lands	Barren Lands	Developed Lands	Forests	Grasslands	Subterranean Systems	Wetlands
Land/Water/Species Management	1	2	1	3	3	1	1	1	1
Education and Awareness	2	3	2	3	1	2	2	4	3
Land/Water Protection	3	1	5	1	3	4	3	1	2
Livelihood, Economic, and Other Incentives	4	4	3	1	3	4	4	5	5
Law and Policy	5	6	5	5	1	3	6	1	4
External Capacity Building	6	5	4	5	3	6	5	5	6
	Indicates a tie within this habitat type								

Top Specific Actions in Ranked Order

In the Habitat Survey, respondents were also asked to identify specific actions for major habitat types using the same action category ranking system outlined in Salafsky et al. (2008). These second-level actions represent subcategories of actions within the major action categories listed in the table above. The following are the top specific second-level conservation actions for habitats in the Drift Plains

Region, aggregated across habitat types:

1. Reduce loss of fish and wildlife habitats (due to agriculture, urban sprawl, commercial development, etc.)
2. Develop education programs in general
3. Develop education programs specifically for K-12
4. Preserve currently existing corridors
5. Increase acres of riparian buffers
6. Reduce conversion to cropland
7. Develop and promote farming technologies and practices that have conservation benefits (e.g., cover crops, no-till, and soil health)
8. Establish training programs for stakeholders
9. Increase regulations on invasive species
10. Acquire conservation easements to protect important wildlife habitats

The following are top actions for SGCN occurring in the Drift Plains Region, as summarized from the free-response questions about conservation actions for individual species:

1. Educate and engage with landowners and citizens (especially regarding bat ecology and issues)
2. Implement agricultural practices that improve water quality
3. Protect large contiguous forested areas and reduce forest fragmentation
4. Control invasive plants
5. Enhance connectivity of habitats
6. Use burning and mowing as management techniques in grasslands
7. Protect and manage large wetland complexes
8. Implement best management practices in forestry
9. Protect/Restore riparian buffer zones
10. Protect subterranean systems and limit recreational caving

Prioritization of Actions

In order to prioritize these actions within an environment of limited resources, respondents were then asked to distribute hypothetical "effort points" to any action they had previously rated as "very important" for any of the major habitat types within a region. The effort ratings were averaged and then ranked to identify the top five actions for each region. A full list of these results can be found in Appendix P. Priority actions for the Drift Plains Region include:

1. Promote diversity of forest types and successional stages
2. Develop and promote farming technologies and practices that have conservation benefits (e.g., cover crops, no-till, and soil health)
3. Control invasive species in forests
4. Preserve currently existing corridors
5. Acquire currently unprotected wetlands

Priority actions in this region are mostly drawn from land, water, and species management and land and water protection. Forests-specific and wetland-specific actions, like promoting diversity of successional stages in forests, controlling invasive species in forests, and acquiring currently unprotected wetlands, were all included in this set of priority actions. Preserving currently existing corridors, which is not tied to any specific habitat type, was another land and water protection effort allocated to this region. Strengthening conservation financing was an external capacity building action identified to facilitate the implementation of the other land-based actions.

Threats and Actions by Major Habitat Type

The following summaries break down threats and conservation actions in this region by major habitat type, based on responses to the Habitat Survey and the Species Survey. The SGCN that occur there, top threats to SGCN, top actions for SGCN, key threats to habitats, and priority actions for each major habitat type in this region are summarized on the following pages.

Threats and actions were only included in detail below if a majority of eligible survey respondents, greater than 50%, rated them, to avoid artificially elevating items, which were highly ranked but only by a few respondents. This approach left some threats and action lists with no items for certain habitats, which is illogical from a practical perspective. Therefore, in these situations, the top threats and actions are still listed but are denoted with an asterisk (*) to signify that there may be some items, which seem out-of-place, reflecting a lack of sufficient response for a particular habitat in the survey. This approach and the survey design also caused for some disparities between threats and actions.

Approximately ten items are given for each list below. Lists may be shorter if fewer than ten items were rated by a majority of survey respondents, or longer if there were tires between items.

Top actions for SGCN were summarized from free-response questions about individual species and do not follow the same categorizations as actions for habitats. A full summary of the Habitat Survey responses can be found in Appendix P.

Agricultural Lands

Agricultural lands are defined as lands devoted to commodity production. Examples of agricultural lands include: intensively managed non-native grasses, row crops, fruit and nut-bearing trees, confined feeding operations, and feedlots.

Top threats to SGCN occurring in agricultural lands in the Drift Plains Region:

1. Natural habitat conversion
2. Conversion of habitat to annual crops
3. Annual and perennial non-timber crops

Top conservation actions for SGCN occurring in agricultural lands in the Drift Plains Region:

1. Educate and engage with landowners and citizens
2. Increase use of CRP partnerships
3. Implement agricultural practices that improve water quality
4. Maintain shallow-water areas for migrating shorebirds
5. Establish no-plow zones
6. Provide incentives to farmers to increase landowner participation

Top threats to fish and wildlife habitats in agricultural lands in the Drift Plains Region:

1. Conversion of habitat to annual crops
2. Housing and urban areas
3. Over-mowing of natural areas
4. Commercial and industrial areas
5. Conversion of natural habitats to other land uses
6. Recreational activities
7. Log jam removal
8. Annual and perennial non-timber crops
9. Tourism and recreational areas
10. Livestock farming and ranching

Top conservation actions for fish and wildlife habitats in agricultural lands in the Drift Plains Region:

1. Reduce loss of fish and wildlife habitats (due to agriculture, urban sprawl, commercial development, etc.)
2. Build and strengthen CRP partnerships
3. Develop education programs in general
4. Develop education programs specifically for K-12
5. Develop and promote farming technologies and practices that have conservation benefits (e.g., cover crops, no-till, and soil health)
6. Preserve currently existing corridors
7. Improve compliance with and enforcement of current policies
8. Link existing habitat blocks through corridor enhancement in agricultural lands
9. Promote conservation payment programs (e.g., payment for ecosystem services, conservation easements)
10. Promote nonmonetary values of natural systems within the state

Aquatic Systems

Aquatic systems are defined as all water habitats, both flowing and stationary. Examples of aquatic systems include: manmade impoundments, natural lakes rivers, streams, oxbows, sloughs, embayments, and backwaters (not including wetlands).

Top threats to SGCN occurring in aquatic systems in the Drift Plains Region:

1. Natural habitat conversion
2. Dams and water management and use

Top conservation actions for SGCN occurring in aquatic systems in the Drift Plains Region:

1. Enhance public, stakeholder, and landowner education and awareness
2. Implement agricultural best management practices to improve water quality
3. Reduce sediment and nutrient loads
4. Reduce point and non-point source pollution
5. Clean up polluted areas
6. Protect and restore riparian buffer zones
7. Reconnect floodplains and rivers
8. Remove dams
9. Reduce bank erosion

Top threats to fish and wildlife habitats in aquatic systems in the Drift Plains Region:

1. Invasive and alien species
2. Conversion of natural habitats to other land uses
3. Annual and perennial non-timber crops
4. Conversion of habitat to annual crops
5. Commercial and industrial areas
6. Problematic native species
7. Housing and urban areas
8. Dams and water management and use
9. Livestock farming and ranching
10. Introduced genetic material

Top conservation actions for fish and wildlife habitats in aquatic systems in the Drift Plains Region:

1. Develop and promote farming technologies and practices that have conservation benefits (e.g., cover crops, no-till, and soil health)
2. Increase acres of riparian buffers
3. Reduce conversion to cropland
4. Reduce stream bank erosion
5. Restore habitats and natural systems in aquatic systems
6. Acquire currently unprotected aquatic systems
7. Preserve currently existing corridors
8. Acquire conservation easements to protect important wildlife habitats
9. Reduce loss of fish and wildlife habitats (due to agriculture, urban sprawl, commercial development, etc.)
10. Reduce nutrient and toxin loads (e.g., heavy metals, pharmaceuticals, fertilizers, insecticides)

Barren Lands

Barren lands are defined as lands dominated by exposed rock or minerals with sparse vegetation. Examples of barren lands include: sand/dunes, rock outcrops, cliffs, and bare rock.

Top threats to SGCN occurring in barren lands in the Drift Plains Region:

1. Natural habitat conversion
2. Dams and water management and use

Top conservation actions for SGCN occurring in barren lands in the Drift Plains Region:

1. Educate public about Peregrine Falcon
2. Protect Bald Eagle nest sites

Top threats to fish and wildlife habitats in barren lands in the Drift Plains Region:

1. Recreational activities
2. Tourism and recreation areas
3. Housing and urban areas
4. Commercial and industrial areas

Top conservation actions for fish and wildlife habitats in barren lands in the Drift Plains Region:

1. Reduce conversion to cropland
2. Strengthen and increase CRP partnerships
3. Reduce loss of fish and wildlife habitats (due to agriculture, urban sprawl, commercial development, etc.)
4. Species reintroduction
5. Develop education programs in general
6. Develop education programs specifically for K-12
7. Training programs for stakeholders
8. Promote conservation payment programs (e.g., payment for ecosystem services, conservation easements)

Developed Lands

Developed lands are defined as highly impacted lands intensively modified to support human habitation, transportation, commerce, and recreation. Examples of developed lands include: urban lands, suburban lands, industrial areas, commercial areas, towers for communication and wind power generation, and recreational areas such as golf courses and soccer fields.

Top threats to SGCN occurring in developed lands in the Drift Plains Region:*

1. Housing and urban areas
2. Commercial and industrial areas
3. Renewable energy production
4. Conversion of habitat to annual crops
5. Invasive and alien species
6. Diseases from domestic populations and unknown sources
7. Mining and quarrying
8. Fossil fuel energy production
9. Tourism and recreation areas

Top conservation actions for SGCN occurring in developed lands in the Drift Plains Region:

1. Enhance public education and awareness (especially regarding bat ecology and issues)
2. Reduce urban sprawl and commercial property expansion
3. Manage urban areas for Peregrine Falcons; minimize disturbance during nesting
4. Increase gravel-surfaced rooftop habitat for breeding Common Nighthawks
5. Mitigate road hazards for wildlife
6. Limit mowing along roads

Top threats to fish and wildlife habitats in developed lands in the Drift Plains Region:

1. Housing and urban areas
2. Commercial and industrial areas
3. Runoff from roads and service corridors

Top conservation actions for fish and wildlife habitats in Developed Lands in the Drift Plains Region:

1. Preserve currently existing corridors
2. Increase acres of riparian buffers
3. Link existing habitat blocks through corridor enhancement in developed lands
4. Reduce loss of fish and wildlife habitats (due to agriculture, urban sprawl, commercial development, etc.)
5. Develop education programs in general
6. Develop education programs specifically for K-12
7. Increase regulations on invasive species
8. Reduce urban sprawl through planning and zoning
9. Establish training programs for stakeholders

Forests

Forests are defined as a plant community dominated by trees. Examples of forests include, but are not limited to, all stages of natural forest and plantations.

Top threats to SGCN occurring in forests in the Drift Plains Region:*

1. Natural habitat conversion
2. Housing and urban areas
3. Conversion of habitat to annual crops
4. Invasive and alien species
5. Annual and perennial non-timber crops
6. Commercial and industrial areas
7. Diseases from domestic populations and unknown sources
8. Fire and fire suppression
9. Wood and pulp plantations
10. Tourism and recreation areas
11. Over-mowing of natural areas
12. Livestock farming and ranching

Top conservation actions for SGCN occurring in forests in the Drift Plains Region:

1. Protect large contiguous forested areas and reduce forest fragmentation
2. Limit conversion of forests to non-forest land uses
3. Control invasive woody plants
4. Restore forests and woodlands
5. Implement best management practices in forestry
6. Reduce development in forested areas
7. Protect roost trees for bat species
8. Create small forest openings to increase diversity

Top threats to fish and wildlife habitats in forests in the Drift Plains Region:

1. Invasive and alien species
2. Housing and urban areas
3. Conversion of habitat to annual crops
4. Problematic native species
5. Commercial and industrial areas
6. Plant diseases
7. Annual and perennial non-timber crops
8. Introduced genetic material
9. Livestock farming and ranching
10. Tourism and recreation areas

Top conservation actions for fish and wildlife habitats in forests in the Drift Plains Region:

1. Control invasive species in forests
2. Preserve currently existing corridors
3. Restore habitats and natural systems in forests
4. Promote use of research and science in conservation decision-making processes
5. Develop education programs in general
6. Develop education programs specifically for K-12
7. Develop alliances and partnerships (e.g., between producers, landowners, and conservation professionals)
8. Increase state's capacity for research and monitoring of conservation actions
9. Promote diversity of forest types and successional stages
10. Reduce conversion to cropland

Grasslands

Grasslands are defined as an open area dominated by grass species. Examples of grasslands include: haylands, pasture, prairies, savannahs, or reclaimed mine lands.

Top threats to SGCN occurring in grasslands in the Drift Plains Region:

1. Conversion of habitat to annual crops
2. Annual and perennial non-timber crops

Top conservation actions for SGCN occurring in grasslands in the Drift Plains Region:

1. Restore and improve connectivity of grasslands
2. Prevent conversion of grasslands to cropland
3. Increase CRP grasslands
4. Reduce woody encroachment on grasslands
5. Use burning and mowing as management techniques in grasslands
6. Improve grazing practices
7. Maintain low wet meadows

Top threats to fish and wildlife habitats in grasslands in the Drift Plains Region:

1. Invasive and alien species
2. Conversion of habitat to annual crops
3. Conversion of natural habitats to other land uses
4. Over-mowing of natural areas
5. Housing and urban areas
6. Fire and fire suppression
7. Annual and perennial non-timber crops
8. Recreation activities
9. Livestock farming and ranching

Top conservation actions for fish and wildlife habitats in grasslands in the Drift Plains Region:

1. Promote diversity of grassland types and successional stages
2. Reduce loss of fish and wildlife habitats (due to agriculture, urban sprawl, commercial development, etc.)
3. Re-establish natural disturbance regimes in grasslands
4. Restore habitats and natural systems in grasslands
5. Develop and promote farming technologies and practices that have conservation benefits (e.g., cover crops, no-till, and soil health)
6. Develop education programs in general
7. Reduce conversion to cropland
8. Promote conservation payment programs (e.g., payment for ecosystem services, conservation easements)
9. Develop education programs specifically for K-12
10. Establish training programs for stakeholders

Subterranean Systems

Subterranean systems are defined as connecting underground rooms and passages beyond natural light penetration. Examples of subterranean systems include: underground waters, above and below the water table, and terrestrial air-filled habitats ranging from large caves to interstitial crevices below soil horizons.

Top threats to SGCN occurring in subterranean systems in the Drift Plains Region:

1. Invasive and alien species
2. Diseases from domestic populations and unknown sources

Top conservation actions for SGCN occurring in subterranean systems in the Drift Plains Region:

1. Protect subterranean systems
2. Limit recreational caving
3. Protect bat hibernacula

Top threats to fish and wildlife habitats in subterranean systems in the Drift Plains Region:

1. Housing and urban areas
2. Runoff from roads and service corridors
3. Recreation activities
4. Invasive and alien species
5. Commercial and industrial areas
6. Roads and railroads

Top conservation actions for fish and wildlife habitats in subterranean systems in the Drift Plains Region:

1. Acquire currently unprotected subterranean systems
2. Preserve currently existing corridors
3. Acquire conservation easements
4. Control invasive species in subterranean systems
5. Restore habitats and natural systems in subterranean systems
6. Develop education programs in general
7. Develop education programs specifically for K-12
8. Establish training programs for stakeholders
9. Increase regulations on invasive species

Wetlands

Wetlands are defined as either ephemeral or permanently flooded habitat. Examples of wetlands include: swamps, marshes, bogs, fens, potholes, wetlands of farmed areas, and mudflats.

Top threats to SGCN occurring in wetlands in the Drift Plains Region:*

1. Natural habitat conversion
2. Invasive and alien species
3. Conversion of habitat to annual crops
4. Annual and perennial non-timber crops
5. Tourism and recreation areas
6. Dams and water management and use

Top conservation actions for SGCN occurring in wetlands in the Drift Plains Region:

1. Protect and maintain large wetlands complexes
2. Restore wetlands
3. Protect buffers around wetlands
4. Control invasive plants in wetlands
5. Create shorebird management areas
6. Mitigate road hazards to amphibians and reptiles when roads cross over wetlands
7. Enroll wetlands in WRP
8. Provide stopover and roosting habitat for cranes
9. Manage for diversity in wetlands
10. Conserve ephemeral wetlands

Top threats to fish and wildlife habitats in wetlands in the Drift Plains Region:

1. Conversion of habitat to annual crops
2. Invasive and alien species
3. Conversion of natural habitats to other land uses
4. Commercial and industrial areas
5. Housing and urban areas
6. Roads and railroads
7. Annual and perennial non-timber crops
8. Runoff from roads and service corridors
9. Point source pollution from commercial and industrial sources
10. Agriculture, residential, and forestry effluents

Top conservation actions for fish and wildlife habitats in wetlands in the Drift Plains Region:

1. Reduce conversion to cropland
2. Increase acres of riparian zones
3. Strengthen conservation financing
4. Develop and promote farming technologies and practices that have conservation benefits (e.g., cover crops, no-till, and soil health)
5. Reduce loss of fish and wildlife habitats (due to agriculture, urban sprawl, commercial development, etc.)
6. Reduce nutrient and toxin loads
7. Restore habitats and natural systems in wetlands
8. Develop education programs specifically for K-12
9. Acquire conservation easements to protect important wildlife habitats
10. Develop alliances and partnerships (e.g., between producers, landowners, and conservation professionals)
11. Promote use of research and science in conservation decision-making processes