3.8 Water Resources and Aquatic Habitats

Water resources are important for recreational purposes as well as for maintaining our fish, mussels, and other species in our streams. These resources are protected by the Clean Water Act and the Illinois Environmental Protection Act. Congress set a goal to "restore and maintain the physical, chemical, and biological components of the waters of the United States."

Section 3.8 describes the physical, biological, and the water quality characteristics of the surface water resources (streams, creeks, rivers, drainage ditches, ponds, and lakes) in the study area. These characteristics provide a baseline from which to assess the project impacts on these water resources. Particular attention will be given to the interaction of the physical characteristics (waterbody size, bottom type, riparian habitat) with the biological characteristics (fish, mussels, aquatic macroinvertebrates) that make up the aquatic habitat(s). The construction, operation, and maintenance of a highway affect these stream characteristics in different ways.

The study area contains 65 streams of varying sizes, 74 ponds, and four lakes. All of these water resources are interconnected within the Kaskaskia River watershed, an area of land where all water drains off into the same place, the Kaskaskia River. The Kaskaskia River watershed is the largest in Illinois at 5,801 square miles, encompassing 22 counties; the watershed includes 292 miles of main stem and 8,680 miles of tributaries. Within the study area there are 28 named streams and 37 unnamed tributaries for a total of 65 streams. The Kaskaskia River watershed is the second most urbanized watershed in Illinois and also contains the largest tract of interconnected floodplain forest, wetlands, and flatwood forests (Miller 2001, IDNR 2001).

Streams

Figure 3.8-1 depicts the locations of streams and their tributaries in the study area. The streams section will briefly discuss and describe nine streams within the study corridor that have been identified as having a special designation (IDOT BDE Manual 26-19.05(c)5). Special designations include navigable waters, streams that have "outstandingly remarkable" natural or cultural values and are listed on the Nationwide Rivers Inventory, Illinois Natural Areas, Biological Stream Rating System (BSRS) High Quality Streams, or impaired streams.

BSRS High Quality Streams are those streams that are designated as Biologically Significant or stream segments rated "A" or "B" for Diversity or Integrity by IDNR.

Figure 3.8-1: Location of Surface Water Resources (Page 1 of 2)

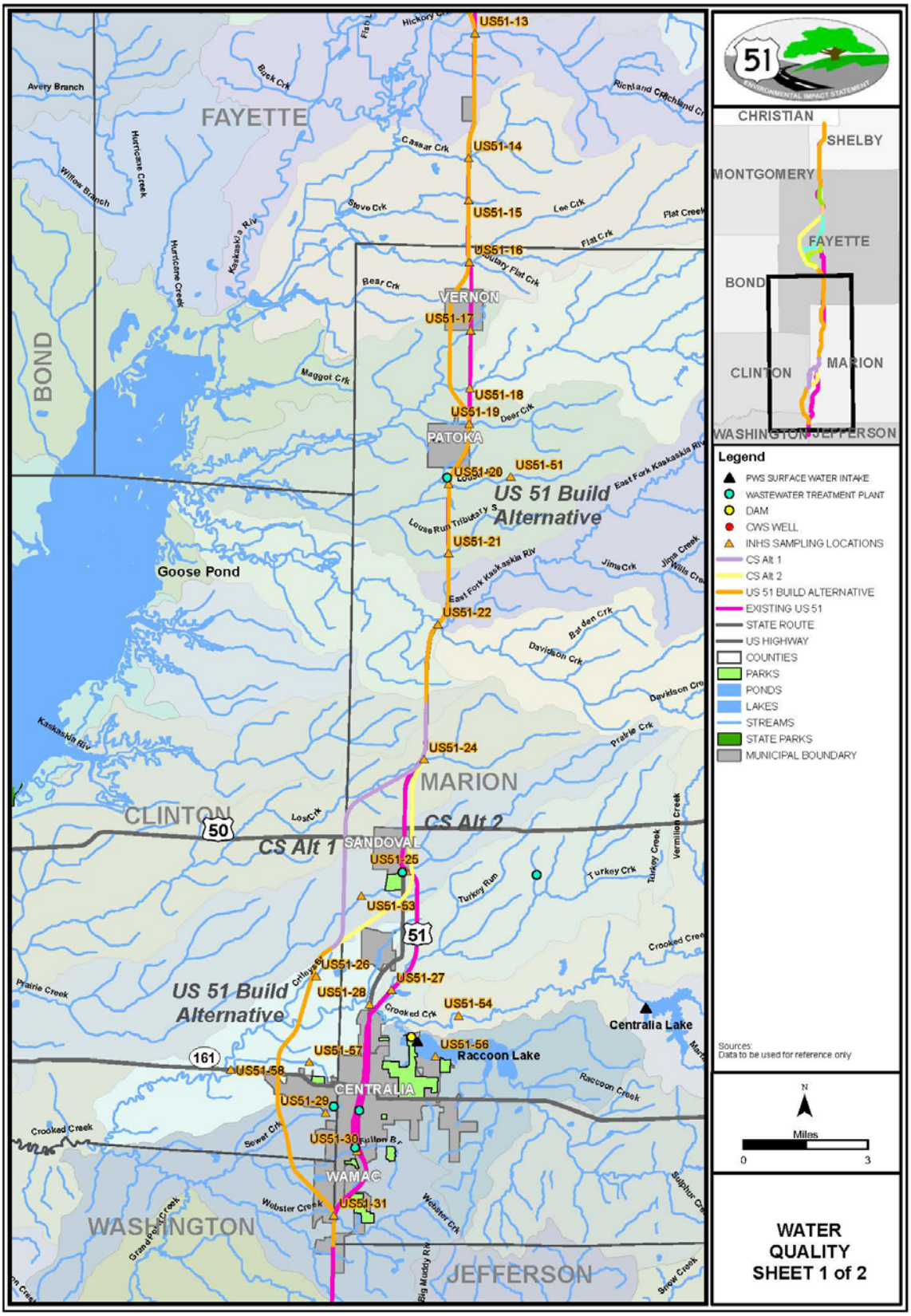
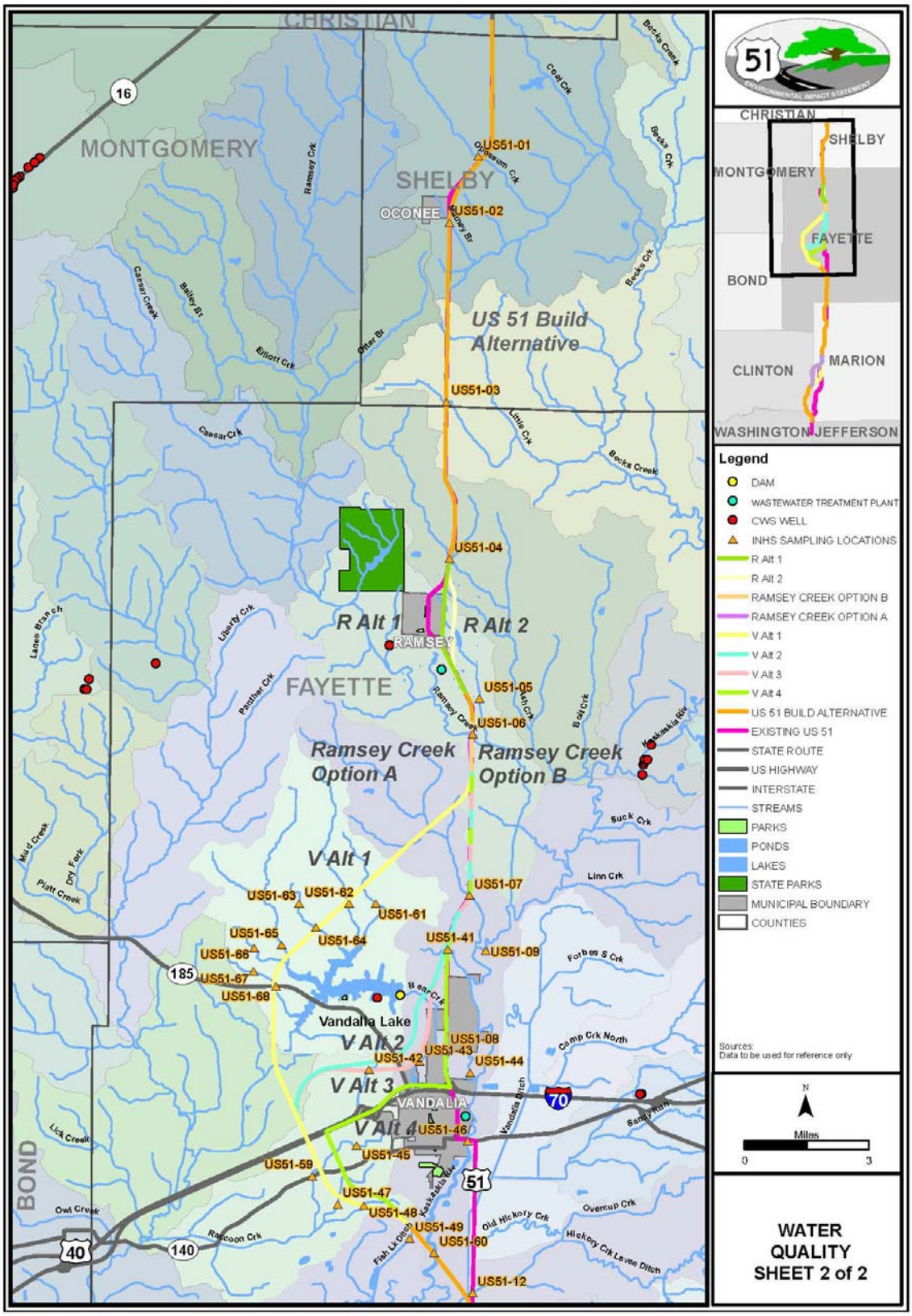


Figure 3.8-1: Location of Surface Water Resources (2 of 2)

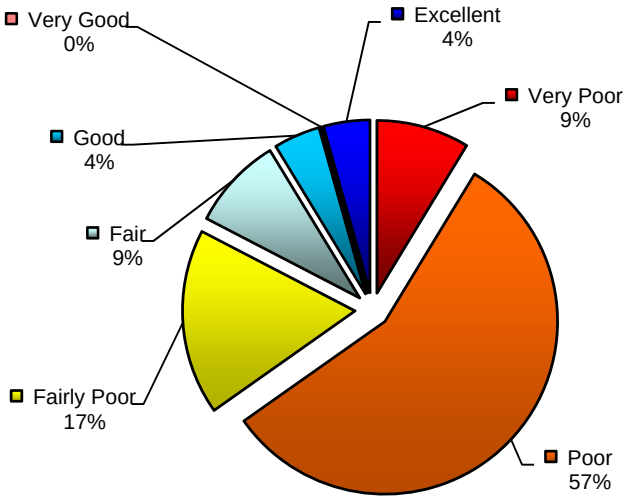


Streams in Study Area

The other streams within the corridor are average or below average in quality for the region.

Various characteristics of stream sites were investigated; 31 were sampled for water quality, 29 for fish, and 27 for aquatic insects. Figure 3.8-2 summarizes the level of organic pollution in the streams using the Hilsenhoff Index (1988) to characterize the stream health. The level of organic pollution is based on the presence of aquatic worms, snails, and aquatic larvae of flies, beetles, and other insects. One stream, the Kaskaskia River, rated "Excellent", the East Fork Kaskaskia River, rated "Good", two were "Fair", and the remaining streams were "Fairly Poor" to "Poor".

Figure 3.8-2
Summary of Level of Organic Pollution in Project Area Streams



The water quality and biological diversity can be impacted by dams and wastewater treatment plants. Figure 3.8-1 depicts the location of dams and wastewater treatment plants in the study area. The only dams are associated with Vandalia Lake, Raccoon Lake, and Carlyle Lake. Wastewater treatment plants are located on the following streams:

- Sewer Creek (Centralia)
- Kaskaskia River (Vandalia)
- Prairie Creek (Sandoval)

- Turkey Creek (Village of Odin)
- Tributary to Ramsey Creek (Ramsey)
- Fulton Branch (Wamac)
- Tributary to Louse Run (Patoka)
- Crooked Creek (Central City)

Water quality sampling at 31 sites provided information on the stream concentrations for various pollutants. A variety of metals and inorganic parameters were analyzed; however, the primary pollutants associated with roadway runoff include three heavy metals (copper, lead, and zinc) as well as chlorides. Other important indicators of stream health are dissolved oxygen, pH, phosphorus, and dissolved solids. Eleven stream sites only exceeded chronic zinc General Use Water Quality standards, and an additional two (Prairie Creek and Louse Run) sites also exceeded both the chronic and acute zinc General Use Water Quality standard. Louse Run also exceeded the chronic copper water quality standard. The only other parameter that exceeded water quality standards was dissolved oxygen (DO). Sampling conducted in 2008 and 2009 indicated that five streams did not meet the seasonal DO standard. These streams were Crooked Creek, Turkey Creek, Prairie Creek, Louse Run, and Cassar Creek. Some of these streams are receiving effluent from wastewater treatment plants which may contribute to these DO conditions.

IEPA has only rated stream uses for 10 streams in the study area and only four of these are rated as "full support." The streams fully supporting aquatic life include the East Fork of the Kaskaskia River, Hickory Creek, Ramsey Creek, and Opossum Creek. The remaining streams are listed as "impaired" and appear on the 303(d) list. The impaired streams on the 303(d) list include Sewer Creek, Crooked Creek, Prairie Creek, Lost Creek, North Fork Kaskaskia River, Hickory Creek, and the Kaskaskia River.

Impaired Streams are those streams that are included on the Clean Water Act Section 303 (d) list of impaired waters in Illinois. These streams do not meet water quality.

Special Designation Streams

Table 3.8-1 summarizes the physical, biological, and water quality characteristics of the nine special designation streams.

Table 3.8-1:
Summary of Special Designation Stream Characteristics

Name	Special Designation	Stream Bottom	Stream Width (feet)	Habitat	Number Fish Species Present	Number Mussel Species live	EPT Richness[1]	Aquatic Life	Causes for Impairment	Sources of Impairment	303(d)
Sewer Creek	Impaired	gravel, sand, cobble, silt, boulder	11.5	trees, herbaceous vegetation	4	0	0	Not Supporting	Sedimentation/ Siltation, Total phosphorus	Municipal Point Source Discharge, Crop Production, Urban Runoff/Storm Sewer	Yes
Crooked Creek	Impaired, BSRS[3] Rated B for Integrity and C for Diversity	gravel, sand, cobble, silt	55.8	trees	24	8	4	Not Supporting	Manganese, Total phosphorus	Municipal point source discharges, Crop production	Yes
Prairie Creek	Impaired	sand, silt, gravel	13.1	trees, grasses	11	4	2	Not Supporting	Dissolved Oxygen, Total Phosphorus	Loss Riparian Habitat, Streambank Modification/Destabilization, Livestock, Crop Production, Agriculture, Pesticide Application, Urban Runoff/Storm Sewer	Yes
Lost Creek	Impaired, BSRS Rated C for Diversity & Integrity	sand, silt, gravel	11.5	trees, grasses	NS[2]	NS[2]	NS[2]	Not Supporting	Dissolved Oxygen, Sedimentation, Total Phosphorus	Loss of Riparian Habitat, Crop Production, Agriculture	Yes
East Fork Kaskaskia River	Impaired	sand, silt, gravel	14.7	trees, herbaceous vegetation	21	9	14	Fully Supporting	Fecal coliform	Source Unknown	Not this segment
North Fork Kaskaskia River	Impaired	sand, silt, gravel	55.8	trees, herbaceous vegetation	12	4	NS[2]	Not Supporting	Manganese, Dissolved Oxygen, pH, Total Phosphorus	Impacts from abandoned mine lands (inactive), Surface mining, Source Unknown, Crop Production	Yes
Hickory Creek	Impaired, BSRS	sand, silt, clay	42.7	trees	19	0	0	Fully Supporting	Fecal coliform	Source unknown	Yes
Kaskaskia River	Impaired	sand, silt, clay	98.5	trees, grasses	18	0	15	Not Supporting	Dissolved Oxygen, Total Suspended Solids, pH, Total Phosphorus, Mercury, Manganese, Fecal Coliform	Source Unknown , Crop production, Atmospheric deposition - toxics	Yes
Ramsey Creek	INAI, BSRS, NRI	sand, gravel, boulders, bedrock	36.1	trees	16	8	11	Fully Supporting	Not Impaired	Not Impaired	No

[1] *Ephemoptera, Plecoptera, and Trichoptera (EPT) are macroinvertebrates (Mayfly, stonefly, and caddisfly) that are sensitive to pollution.*
[2] *Not sampled*
[3] *Biological Stream Rating System*

Sewer Creek is listed as an impaired stream (IEPA, 2014), as the stream doesn't support aquatic life due to sediment and phosphorus levels. The City of Centralia's wastewater treatment plant outfall is located approximately 0.46 mile west of existing US 51. A strong odor of chlorine was present during the 2008 assessment which may have been caused by a treatment plant upstream of the sample station. There was an absence of macroinvertebrates sensitive to pollution during the survey of Sewer Creek. The extremely low number of species as well as habitat conditions present at the Sewer Creek site suggests low stream quality. Three water quality samples were collected at one sampling location on Sewer Creek during 2008.

Sewer Creek

Chloride levels ranged from 65.8 mg/L to 111 mg/L; these concentrations meet the General Use Water Quality standards of 500 mg/L but are indicative of wastewater discharges. The General Use Water Quality standards were achieved.

Crooked Creek contains a relatively diverse fish population with 24 species present. The diversity is due to its relatively larger size, variety of water depths, and abundance of woody debris. A portion of Crooked Creek just upstream of the proposed and existing US 51 crossings has been rated by the IDNR as Fair for diversity and Good for integrity. Crooked Creek is not supporting of aquatic life use (IEPA, 2014) and is listed as an impaired) stream due to manganese and phosphorus concentrations greater than the water quality standard. A wastewater treatment plant outfall is located on Crooked Creek at Central City approximately 0.38 mile west of existing US 51. The dissolved oxygen level for two samples collected in 2008 and 2009 along Crooked Creek did not meet the General Use Water Quality standards.

Crooked Creek

Prairie Creek is a medium-sized creek with steep banks and a high level of siltation. The stream is shallow with a poor aquatic habitat. Prairie Creek is not supporting aquatic life use (IEPA, 2014) and is listed as an impaired stream due to dissolved oxygen and phosphorus levels. A water sample was collected in 2009 and had low dissolved oxygen which may be attributed to low flow conditions. Prairie Creek had a zinc water quality violation during sampling in 2009 that may be attributed to Sandoval Zinc Company, a Superfund site.

Prairie Creek

Biologically Significant Streams are streams with unique biological communities as determined by the IDNR.

Lost Creek is a medium-sized stream rated as a Biologically Significant Stream by the IDNR as previous fish collections contained diverse fish species. Currently the stream is considered not supporting of aquatic life use (IEPA, 2014) and is listed as an impaired stream due to dissolved oxygen levels, sedimentation, phosphorus, and algae. The IDNR in the biological rating system (BSRS) rated Lost Creek as Fair for the types of aquatic life found in the stream. This rating was based on the types of species found in the stream.

Lost Creek

The East Fork Kaskaskia River contains a relatively diverse fish population with 21 species collected near the existing US 51 bridge. The presence of four darter species, and the low levels of siltation observed during site visits, suggests a water body of slightly higher than average quality. Nine types of mussels were collected near the existing US 51 bridge. According to IEPA, there are two parts of the East Fork that were evaluated and one part is impaired due to fecal coliform; however, the segment near US 51 supports aquatic life. The water quality samples collected near US 51 met all the water quality standards.

East Fork Kaskaskia River

The North Fork Kaskaskia River has steep banks and deep water depths; the fish population does not indicate a high quality habitat; the fish population is dominated by two game species which represent the potential for a healthy sport fishery within the North Fork Kaskaskia River. However, the North Fork Kaskaskia River is not supporting of aquatic life use (IEPA, 2014), and is listed as an impaired stream for a variety of chemicals, including dissolved oxygen.

North Fork Kaskaskia River

Hickory Creek is a medium-sized stream with steep banks and a high level of siltation. The observed fish population and habitat conditions are not indicative of high quality habitat. The main species identified occur in disturbed streams. Hickory Creek does fully support aquatic life but is listed as impaired due to bacteria present in the stream.

Hickory Creek

The Kaskaskia River was the largest stream sampled and contained an average species diversity due to a lack of habitat diversity. This stream is impaired due to low dissolved oxygen, suspended solids, mercury, manganese, and fecal coliform. Stream sampling in 2009 indicated that one sample exceeded the zinc chronic water quality standard. Most of the species present are tolerant or intermediate species and common in small to medium sized rivers in central Illinois. However, one state threatened species, the western sand darter, was located at a sampling point near the public boat ramp in Vandalia. The Shelbyville and Carlyle dams on the Kaskaskia River affect the physical, biological, and water quality characteristics. The occurrence of an intolerant fish species at two sampling sites indicates siltation levels are low and that habitat quality may be better than average for streams in south central Illinois.

Kaskaskia River

Ramsey Creek has special designations from IDNR because of its high quality. Ramsey Creek is a Biologically Significant Stream and an Illinois Natural Area stream (INAI #1435) due to its unique aquatic populations. Additionally, Ramsey Creek is listed on the Nationwide Rivers Inventory due to its fish population and undeveloped nature. However, at the crossing of US 51 the stream contained only 16 species of fish and four types of mussels. Ramsey Creek is 36 feet wide with minimal loose gravel and low levels of siltation. The number of fish species present and the lack of intolerant species suggest that stream quality was average. The water quality achieved all standards and is supporting aquatic life.

Ramsey Creek

Lakes

Vandalia Lake, Vandalia, IL

Vandalia Lake is located in Fayette County, four miles northwest of Vandalia. Vandalia Lake is a 660 acre lake with 12 miles of shoreline and is used as a secondary drinking water supply for the City of Vandalia which normally obtains drinking water from the Kaskaskia River. Vandalia Lake supports a recreational fishery in addition to a marina, campground and swimming beach (Vandalia, 2011a, 2011b).

The IEPA (2014) has designated Vandalia Lake as fully supporting aquatic life and public water supply/food processing. However, the IEPA specifies that Vandalia Lake does not support fish consumption or aesthetics due to mercury, suspended solids, phosphorus and algae. The lake has not been assessed for any other use such as primary contact or secondary contact. No fish consumption advisories are posted for Vandalia Lake by the Illinois Department of Public Health. (IDPH 2011).

The lake is stocked with largemouth bass, channel catfish, and bluegill by the Vandalia Sport Fishing and Conservation Club. Historical sampling of the lake yielded common fish species - none of which are pollution intolerant. Shore vegetation was not noted during surveys but adjacent land use consists of a park, residential, and open space (Wetzel 2009, Wetzel Editor 2010, Wetzel et al. 2010).

Carlyle Lake

Carlyle Lake State Fish & Wildlife Area is located in Fayette, Bond, and Clinton Counties, approximately 14 miles southwest of Vandalia and downstream from US 51. Carlyle Lake is a 26,000-acre multipurpose lake administered by the U.S. Army Corps of Engineers (USACE). The IDNR has a 25-year lease on part of the USACE property to conduct a variety of habitat management measures aimed at increasing food, shelter and nesting areas for numerous wildlife species. Carlyle Lake is known as one of the top waterfowl hunting areas in the state. Fishing is available on more than 2,000 acres of the lake and on the Kaskaskia River. (IDNR, 2012, http://dnr.state.il.us/lands/landmgt/parks/r4/CARLYLE.HTM#Flooded) Common fish species, such as bass, bluegills, bullhead, and crappie have been collected in the lake. Only one fish species, the smallmouth bass, is considered intolerant of pollution.

How will the new highway impact water resources?

The impact methodology is broken down by the phases of the highway life cycle: construction, operation, and maintenance. Construction impacts involve the clearing of vegetation, grading, and building of structures over, within, and adjacent to water resources. Operational impacts are those that occur after a roadway is open to traffic and include the effects of storm water runoff on adjacent water resources. Maintenance impacts are those that occur as part of normal highway operations such as snow / ice removal, mowing / spraying and ditch cleaning.

Construction

The greatest concern for water resources during construction is the possible realignment of Webster Creek and the possible siltation while constructing bridges and box culverts at the stream crossings. The magnitude of the siltation impact will vary according to site specific conditions such as the type of crossing structure, bank profile, stream size, soil type, and stream substrate. Studies indicate increases of five to 12 times more fine sediment suspended in streams impacted by road construction and increases in suspended sediment were detected up to 16 miles downstream. Some of the sites included erosion control measures; however, the storm events, site conditions, and erosion control measures all affected the stream quality.

There will be numerous stream crossings associated with the alternatives. Most of these will be culverts; however, bridges are planned for the Kaskaskia River and other streams. Table 3.8-2 summarizes the number of crossings for each of the alternatives.

US 51 Build Alternative

The alternative between the larger towns where there is only one remaining alternative is referred to collectively as the US 51 Build Alternative. The US 51 Build Alternative is shown in orange below. Existing US 51 is shown in pink.

The US 51 Build Alternative is compared against the No Build Alternative. The US 51 Build Alternative and the remaining alternatives near the larger towns are described in Chapter 2.3.

Table 3.8-2:
Summary of Stream Crossings for the Alternatives

Alternative	No. of Stream Crossings	Number of Culverts	Number of Bridges
US 51 Build Alternative	55	33	22
CS Alt 1	1	0	1
CS Alt 2	2	0	2
V Alt 1	19	16	3
V Alt 2	10	7	3
V Alt 3	10	7	3
V Alt 4	7	4	3
R Alt 1	3	3	0
R Alt 2	3	3	0
RCOA/B	1	0	1

The crossings include improvements to existing structures for US 51 Build Alternative and new crossings for the other alternatives. Stream disturbance is affected by the type of crossing and soil in the area of the crossing. Bridges only include piers in the stream or on adjacent stream banks while culvers cause loss of stream bottom.

Approximately 1,100 linear feet of the north tributary to Webster Creek is expected to be realigned by the US 51 Build Alternative. Webster Creek begins south of the City of Centralia from which it flows 8.9 miles southwest where it joins with Sewer Creek west of Wamac. The north tributary to Webster Creek joins Webster Creek within the proposed location of the interchange between the existing US 51 and the US 51 Build Alternative, south of the City of Centralia.

Direct impacts would result from grading, excavation, placement of fill, and vegetation removal to construct the realignment. In addition to the realignment, new roadway crossings of Webster Creek and its north tributary with the proposed interchange ramps will also affect the hydrology.

Mitigation for stream re-alignment will be needed per 33 CFR part 332 and IDOT may use the Illinois Stream Mitigation Guidance. Meanders will be incorporated as part of the mitigation, to the extent feasible.

Webster Creek does not have a special designation and is not a stream that is above average quality for this region of Illinois. Special designations include navigable waters, streams that have "outstandingly remarkable" natural or cultural values, streams that are listed on the Nationwide Rivers Inventory, Illinois Natural Areas, Biological Stream Rating System (BSRS) High Quality Streams, or as impaired streams.

Webster Creek was assessed upstream of the existing US 51 bridge over Webster Creek during 2008. The streambed of Webster Creek consists of sand, silt, clay and gravel. Webster Creek has a measured width of 11.5 feet wide and a depth of 3.6 feet. The vegetation adjacent to the creek consists of trees and grasses. The surrounding land use is industrial and forest. The INHS aquatic habitat assessment for Webster Creek classified the stream as poor.

Fish, mussels, and macroinvertebrates were sampled at Webster Creek in 2008. Eight species of fish were collected with bluegills dominating 59 percent of the collection. In addition to the habitat assessment of the stream, the INHS assessed water quality of the stream and rated it as "poor" water quality. No intolerant fish species were collected in Webster Creek. Mussel collection efforts yielded no live specimens. The IDNR has not assessed Webster Creek for diversity, integrity or biological significance.

The crossings of streams with special designations are described as these streams receive special consideration. Table 3.8-3 summarizes the proposed in-stream work and crossing.

Table 3.8-3:
Construction Impacts for Special Designation Streams

Stream	Alternative	Structure	Stream Impacts
Sewer Creek	US 51 Build Alternative	1-70 ft bridge	One pier
Crooked Creek	US 51 Build Alternative	1-130 ft bridge	Two piers
Prairie Creek	CS Alt 2	1-100 ft bridge	Two piers
Lost Creek	CS Alt 1	1-40 ft bridge	No piers in stream
Lost Creek	CS Alt 2	1-40 ft bridge	No piers in stream
E. Fork Kaskaskia River	US 51 Build Alternative	1-120 ft bridge	Two piers
N. Fork Kaskaskia River	US 51 Build Alternative	1-400 ft bridge	Four piers
Hickory Creek	US 51 Build Alternative	1-510 ft bridge, 1 culvert	Four piers
Kaskaskia River	US 51 Build Alternative	1-700 ft bridge, 10 culverts	New structure with 7 piers in river and substrate loss
Ramsey Creek	RCOA/RCOB	1-235 ft bridge	4 piers

There will be nine bridges across the special designation streams reducing the impact to the loss of stream bottom for aquatic life associated with culverts. The piers will be placed outside the stream for six of the streams. For the Kaskaskia River, North Fork Kaskaskia River, and Hickory Creek piers will be placed in the stream. As the highly erodible soils are near the stream banks, special provisions will be used for erosion control to minimize impacts to these streams during construction. The high quality streams of Ramsey Creek and Lost Creek will be bridged for the US 51 Build Alternative and CS Alt 1, respectively. The bridges will minimize potential impacts to the fisheries and mussels in these two streams.

Operation

Studies indicate that pollutants in highway runoff are not present in amounts that threaten surface water or groundwater quality when the Annual Average Daily Traffic (AADT) is less than 30,000 vehicles per day (vpd) (Driscoll, et al., 1990). Since the predicted traffic volume in the year 2040 is approximately 10,000 vehicles per day (vpd), the water quality impacts on receiving waters from stormwater runoff are minor. The stream water quality standards for the metals will be maintained for the alternatives.

Stream

For the nine special designation streams the additional pollutant concentrations associated with highway runoff were estimated. This included lead, copper, zinc, and chlorides. These increased concentrations were compared to the state water quality standards that protect fish and general stream uses. All streams achieved the water quality standards.

Lakes

Two lakes, Vandalia Lake and Carlyle Lake, potentially would receive storm water runoff from the alternatives. The only Vandalia alternative with storm water draining to Vandalia Lake is V Alt 1. V Alt 1 crosses four small tributaries that drain to Vandalia Lake. The pollutant loading from V Alt 1 will not cause any water quality violations in Vandalia Lake and will not affect the sport fishery. Additionally, all of the streams in the US 51 area ultimately drain to the Kaskaskia River and then to Carlyle Lake. The water quality of these two lakes will not be affected by runoff from US 51 based on the size of these lakes and small contribution of US 51.

Maintenance

Maintenance impacts include the use of deicing salt for snow and ice control and herbicide usage for control of noxious/invasive plant species. Chlorides are found in all natural waters. Sources of chlorides include those of natural mineral origin, human and animal wastes, and industrial effluents. The chloride content of various waters of interest in parts per million (ppm) are as follows: rain water (2 ppm), unpolluted river water (up to 15 ppm), and weak sewage (70 ppm).

Maintenance of highway facilities contributes chlorides to area streams during the winter months. In northern US climate areas, deicing chemicals, such as sodium chloride and calcium chloride salts, are used during freezing conditions. Highway runoff during these conditions may contain chlorides.

Deicing salt, along with plowing and sanding, are seasonal tools for highway snow and ice control. Deicing salt produces public mobility and safety benefits by rapidly and reliably providing more drivable and less hazardous road conditions during the winter months. Road salt impacts on vegetation and soil tend to diminish rapidly with distance from the roadway.

Salt is applied to roadways during and after snow and/or ice storms. Most of the salt is plowed along with snow and ice to the shoulder and adjacent right-of-way. The deicing salt then moves through the environment as runoff, splash, and spray. As the snow or ice melts, the salt moves through to the drainage system until it enters a stream as runoff or percolates into the soil profile. Salt also is transported via the splash or spray generated by moving vehicles coming into contact with brine or slush. Studies indicate that 60 to 80 percent of the salt runs off into the surface water, 15 to 35 percent occurs as splash, and up to three percent occurs as spray (Frost, et al, 1981; Diment, et al, 1973; Lipka and Aulenback, 1976; Sucoff, 1975).

The analysis of deicing chemical (chloride) concentrations in receiving waters was completed using a methodology developed by the United States Geological Survey (Frost, et al., 1981). The methodology considers basin characteristics: drainage area, slope, depression storage, quantity of salt applied, precipitation in the basin, length of the highway, and number of lanes within the basin. IDOT typically uses 10 tons per lane mile of salt during winter conditions. The stream chloride concentrations for all alternatives remained below the chloride water quality standard of 500 mg/L.

What measures are proposed to avoid or minimize effects to surface water resources and quality?

Design, construction, and operational features would be included in the design of the alternatives to minimize highway impacts upon receiving streams. These measures would include the use of drainage ditches, erosion control features, and deicing management. Stream mitigation measures are specifically required for the realignment of Webster Creek. The Illinois Stream Mitigation Guidance will be used to determine the appropriate mitigation measures.

Mitigation measures are identified in IDOT specifications to reduce erosion potential. Soil erosion control practices would limit sediment reaching the stream. For example, river and stream banks disturbed by construction would be re-vegetated immediately following construction. Raw banks would be mulched or protected with blankets until vegetation is established.

Any construction in an existing waterway would be conducted in low- to zero-flow conditions. As necessary, flow will be maintained during construction, and erosion and sediment controls will be used to minimize downstream impacts.

Disturbance to streamside vegetation will be kept to a minimum. Temporary fencing or alternative measures would be considered to protect existing vegetation to remain in critical erosion prone areas. Opportunities for stream enhancements (e.g., streambank stabilization, installing rock riffles) within the study corridor watersheds will be investigated with mitigation.

Storm water effects will be minimized by collection of all storm water runoff in a ditch system.

Deicing is important to maintain safe roads; however, IDOT continues to develop improved maintenance and management strategies to minimize salt application rates.