Logan River Restoration
Draft Conservation Action Plan
Summary Spreadsheet
February 2016

The attached Summary Spreadsheet is accompanied by a Draft Conservation Action Plan Summary Report, available on the Logan City website, www.loganutah.org. The Summary Report provides information about the Conservation Action Planning (CAP) process and methods. This spreadsheet provides greater detail for readers who are interested in delving deeper into the specifics of the draft CAP indicators and strategic actions.

The Summary Spreadsheet is presented in two sections:

- Section 1 lists current and desired ratings of river health by reach of the river (upper, middle, and lower). Reaches are illustrated in Figure 1. Section 1 also lists rating criteria and notes that explain indicators and ratings.

- Section 2 lists the rationale for each indicator, objectives of the CAP, issues/concerns/threats, and finally strategic actions that can be implemented by the Task Force, Logan City, and residents to achieve the desired condition for each indicator.

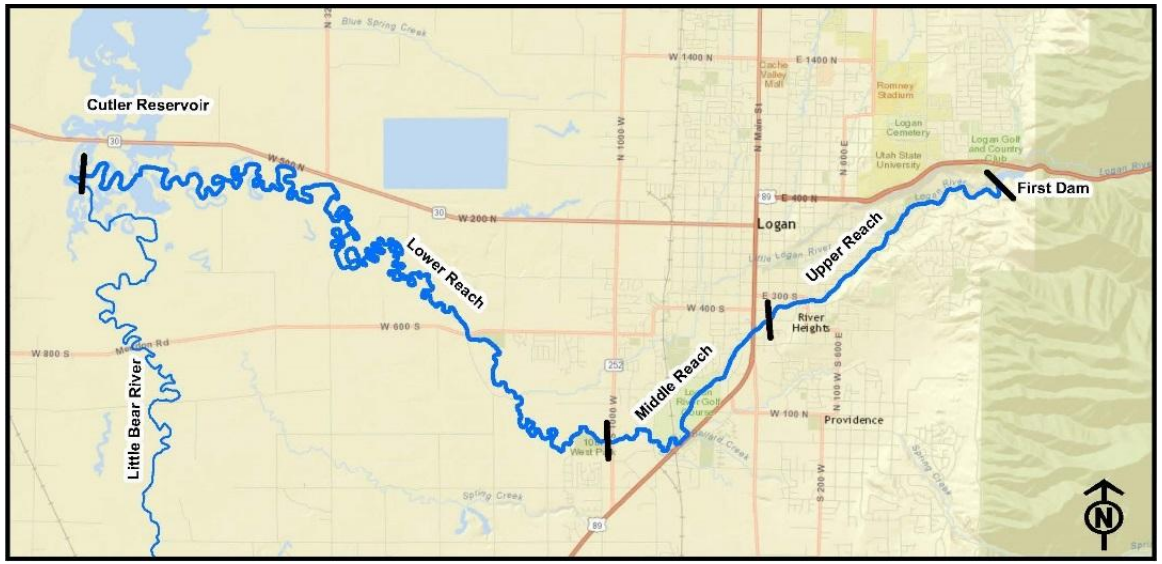

Figure 1. Logan River Restoration Conservation Action Plan (CAP) study area.

Indicator	Reach	Current Rating	Desired Rating	Poor	Fair	Good	Very Good	Notes:
Flow Regime (Spring Peak Flows)	Upper	Good	Good	Heavily altered flow regime. Hydrograph does not resemble the natural/historical hydrograph	Moderately altered flow regime, non-natural hydrograph	Minimally altered flow regime	Natural flow regime, no alteration of hydrograph in terms of magnitude, duration, and timing of peak flows	There are several diversion dams currently on the Logan River which affect summertime base flows much more than spring runoff. These are run-of-the-river dams with no significant storage and therefore this indicator is rated as good under current conditions.
	Middle	Good	Good					
	Lower	Good	Good					
Flow Regime (Summer Base Flow)	Upper	Poor	Good	Minimum flows throughout most of the reach marginally sufficient in terms of water temperature and dissolved oxygen to support cold water fishery, and mostly disconnects aquatic habitats (<10 cfs)	Minimum flows throughout most of the reach insufficient in terms of water temperature and dissolved oxygen to support cold water fishery, and partially disconnects aquatic habitats (10-30 cfs)	Minimum flows throughout most of the reach sufficient in terms of water temperature and dissolved oxygen to support cold water fishery, and mostly connects aquatic habitats (30-60 cfs)	Minimum flows near natural throughout the entire reach sufficient in terms of water temperature and dissolved oxygen to fully support cold water fishery, and fully connects aquatic habitats (>60 cfs)	Upstream and within reach water diversions significantly reduce summer base flows. The iUTAH gage at the Water Lab indicates a base flow of approximately 90 cfs. Within reach diversions reduce base flows within the lower end of the reach (below Crockett and Providence Diversions) late July through end of September to approximately 15 cfs, with times of reduced flows to <3 cfs as indicated at the iUTAH gage at Main Street. Base flows outside of the irrigation season (October-March) are approximately 90 cfs at the Main Street gage.
	Middle	Poor	Good					
	Lower	Poor	Good					

Indicator	Reach	Current Rating	Desired Rating	Poor	Fair	Good	Very Good	Notes:
Flood Conveyance Through Reach	Upper	Fair	Good	Flood conveyance through reach significantly impacted by sand/gravel deposition and woody debris accumulation on a relatively frequent runoff event (<10-yr flood event)	Flood conveyance through reach partially impacted by sand/gravel deposition and woody debris accumulation on a fairly infrequent runoff event (>25-yr flood event)	Flood conveyance through reach partially impacted by sand/gravel deposition and woody debris accumulation only during a rare runoff event (>50-yr flood event)	Flood conveyance through reach not impacted by sand/gravel deposition and woody debris accumulation except during extremely rare runoff event (>100-yr flood event)	**Upper Reach**: Sand/gravel is effectively transported through this steep and confined upper reach with limited locations of bedload deposition (i.e., bar development). Sand bagging was necessary in the upper reach during the last 25-yr runoff event in 2011. Most woody debris has been cleared from the channel in the upper reach but the potential for large trees to fall into the channel and block flow is a concern.
	Middle	Fair	Good					**Middle Reach**: Current condition is Good from 100 East to Golf Course Road and Poor from Golf Course Road to 1000 West. Evidence of historic dredging indicates sand and gravel deposition has occurred historically in the middle reach. Recent dredging following the 2011 (25-yr event) shows that sand and gravel accumulation continues to impact flood conveyance. Also, excessive woody debris accumulation of crack willow branches (dams) including large fallen trees spanning the channel significantly impact flood conveyance throughout the lower portions of the middle reach.
	Lower	Fair	Good					**Lower Reach**: Evidence of historic dredging indicates sand and gravel deposition has occurred historically in upper portion of the lower reach. Also, excessive woody debris accumulation of crack willow branches (dams) including large fallen trees spanning the channel significantly impact flood conveyance throughout the lower reach.

Indicator	Reach	Current Rating	Desired Rating	Poor	Fair	Good	Very Good	Notes:
Floodplain Function	Upper	Poor	Fair	Floodplain functions severely limited within reach with widespread portions of floodplain non-existent on one or both sides of channel. Floodplain is highly manipulated and/or disconnected from channel due to anthropogenic factors such as channelization, bank manipulation, filling and/or levee development.	Floodplain functions partially limited within reach with portions of floodplain impaired on one or both sides of channel. Floodplain is partially manipulated and/or disconnected from channel due to anthropogenic factors such as channelization, bank manipulation, filling and/or levee development.	Floodplain mostly functioning within natural variability of the current setting.	Floodplain fully functioning within natural variability of the current setting.	Floodplain functions severely limited in upper portions of middle reach due to channelization, bank manipulation, fill, structures and levee development. Due to existing development constraints, "fair" is likely the best condition that can be achieved in the upper reach and in the middle reach from 100 East to Golf Course Road. Below Golf Course Road, improvement to "good" condition is a realistic objective.
	Middle	Poor	Fair					
	Lower	Poor	Good					
Instream Habitat	Upper	Fair	Good	>66% departure from natural	33-66% departure from natural	10-33% departure from natural	<10% departure from natural	This indicator includes hydraulic complexity and habitat diversity, including a natural sequence of pools and riffles, a variety of pool sizes and depths, and stable woody materials in the bed and banks.
	Middle	Fair	Good					
	Lower	Fair	Good					

Indicator	Reach	Current Rating	Desired Rating	Poor	Fair	Good	Very Good	Notes:
State Water Quality Standards for All UDEQ Beneficial Uses	Upper	Good	Very Good	Standards exceeded more than 50% of time	Standards exceeded 10% - 50% of time	Standards exceeded less than 10% of time	Standards rarely exceeded	**Upper Reach**: Logan River is not considered impaired by the UDWQ according to the 2014 303d list. UDWQ determines a waterbody is impaired when state water quality standards are exceeded more than 10% of samples over a 10-yr period. Water temperatures and dissolved oxygen concentrations are well within State 3A Standards at the Water Lab and Main St iUTAH gages.
	Middle	Good	Very Good					**Middle Reach**: Logan River is not considered impaired by the UDWQ according to the 2014 303d list. Water temperatures and dissolved oxygen concentrations are within State 3A Standards at the Main St iUTAH gage (above middle reach) but exceedances of both water temperatures >20 degrees C and <6mg/l of dissolved oxygen have occurred the past two years at the Mendon iUTAH gage (below middle reach).
	Lower	Fair	Good					**Lower Reach:** Logan River is not considered impaired by the UDWQ according to the 2014 303d list. Water temperatures >20 degrees C and dissolved oxygen concentrations <6mg/l have occurred the past two years at the Mendon iUTAH gage.

Indicator	Reach	Current Rating	Desired Rating	Poor	Fair	Good	Very Good	Notes:
Trout Density & Size	Upper	Poor	Very Good	Density < 500/mile Size <0.10	Density 500 - 999 Size 0.10 - 0.19	Density 1,000 - 1,499 Size 0.20 - 0.29	Density >1,500 Size > 0.30	Density is measured in fish > 4 inches per mile. Size structure is measured in Proportional Stock Density (PSD) which is the ratio of big fish (> 15 inches) to stock size fish (> 9 inches). The overall rating is the lesser of the two ratings; for example a site with fair density but poor size receives an overall rating of poor. Current ratings of poor condition for all three reaches are based on past size structure data and it is this metric that is going to predominantly determine the future rating. Native Fish Species: Improvements in instream habitat, water quality, and summertime flows would also benefit native fish species such as whitefish and sculpin (both common in lower Logan River, but with less population information than brown trout) and possibly cutthroat trout (absent to rare below First Dam).
	Middle	Poor	Very Good					
	Lower	Poor	Very Good					
Benthic Invertebrates Observed/Expected (UTDEQ Predictive Model)	Upper	Very Good	Very Good	Less than 69% of expected taxa	70 -75% of expected taxa	76 - 85% expected taxa	Greater than 85% of expected taxa	Condition based on composition of observed invertebrate species compared to expected invertebrate species within unaltered river conditions.
	Middle	Fair	Very Good					
	Lower	Poor	Good					
Riparian Vegetation Condition	Upper	Poor	Fair	>66% departure from natural	33-66% departure from natural	10-33% departure from natural	<10% departure from natural	This indicator includes a combination of the percent of floodplain area that is riparian habitat, structure, and percent native vegetation.
	Middle	Poor	Good					
	Lower	Poor	Good					
Cache County Noxious Weeds	Upper	Good	Very Good	Widespread invasion of noxious weeds	Noxious weeds common	Noxious weeds minimally present	No noxious weeds	Noxious weeds determined by State and County weed list.
	Middle	Poor	Very Good					
	Lower	Poor	Very Good					

Indicator	Reach	Current Rating	Desired Rating	Poor	Fair	Good	Very Good	Notes:
Bird Species Richness and Diversity	Upper	Fair	Good	Diversity < 2.685 Richness < 26.5	Diversity 2.685-2.941 Richness 26.5-37.4	Diversity 2.942-3.197 Richness 37.5-48.3	Diversity >3.197 Richness >48.3	Species richness and species diversity calculated using Shannon-Wiener Index. The overall rating is the lesser of the two ratings; for example, a site with fair diversity but poor richness would be rated poor.
	Middle	Fair	Very Good					
	Lower	Fair	Very Good					
Amphibians and Reptiles	Upper	Fair	Very Good	No native amphibians present; non-native amphibians established	Native amphibians present with limited breeding locations; non-native amphibians established	Native amphibians present with multiple breeding locations identified; non-native amphibians may be present but not well established	Native amphibians present, multiple breeding locations identified and protected; non-native amphibians not present	Native species include two snakes (Wandering Gartersnake and Common Gartersnake), three frogs (Northern Leopard Frog, Boreal Chorus Frog, and Woodhouse's Toads), and one salamander (Tiger Salamander). All of these species except for the toad and the salamander occur in all three reaches; the toad and the salamander likely occur only in the lower reach
	Middle	Fair	Very Good					
	Lower	Poor	Fair					
Trail Continuity	Upper	Poor	Very Good	More that two breaks within reach	Two breaks	One break	No breaks	This attribute is designed to capture trail continuity; breaks include, for example, at-grade road crossings without pedestrian crossings, signals. The CAP project is not promoting trail development through property of unwilling landowners. Therefore, trail continuity would be achieved by routes that connect existing and future parks, trails, and access points without necessarily paralleling the river throughout the entire river corridor. Possibly property could be acquired for river access or park development/expansion.
	Middle	Poor	Very Good					
	Lower	Poor	Very Good					

Indicator	Reach	Current Rating	Desired Rating	Poor	Fair	Good	Very Good	Notes:
Legal Access To River Bed (wading)	Upper	Very Good	Very Good	<25% of reach length.	25-50% of reach length.	50-75% of reach length.	>75% of reach length.	Reflects legal ability to access and utilize riverbed. It assumes river is public water (Public Trust Doctrine), so surface access is in place. This decision is subject to appeal. A park expansion would increase the accessible river bank through public property.
	Middle	Very Good	Very Good					
	Lower	Very Good	Very Good					
Legal Access To River Bank (above high-water line)	Upper	Poor	Fair	<25% of reach length.	25-50% of reach length.	50-75% of reach length.	>75% of reach length.	Reflects legal access to river bank using public property, not private property. A park expansion would increase the accessible river bank.
	Middle	Poor	Fair					
	Lower	Poor	Fair					
Access facilities (pedestrian/ADA access points, parking, boat launches, kayak parks)	Upper	Poor	Good	Adequate on no facility types.	Adequate on 1-2 facility types.	Adequate on 2-3 facility types.	Adequate on all 4 facility types.	This indicator reflects public facilities used to access river or support use. Determination of adequacy based on specific reach.
	Middle	Fair	Very Good					
	Lower	Poor	Good					
Fishing success/catch rate of Salmonids (Brown Trout and Whitefish)	Upper	Fair	Very Good	Catch rate les than or equal to 0.25 Salmonids/hour	Catch rate of 0.26 to 0.50 Salmonids/hour.	Catch rate of 0.51 to 0.75 Salmonids/hour.	Catch rate greater than or equal to 0.76 Salmonids/hour	From Paul Thompson, UDWR Northern Region Fisheries Manager: In general, we set statewide objectives for catch rates at Utah flowing waters to meet or exceed 0.5 fish/angler hour. We do not break it out further than that. For perspective, the latest creel surveys for the lower Provo River and middle Provo River indicated catch rates of 0.75 and 0.88 fish/angler/hour. The Provo is one of the top two destination waters in the state. The latest creel survey for the Weber River from the town of Uinta upstream to Lost Creek was 1.28 fish/angler/hour. The Weber is the 3rd most visited flowing water in Utah. So your break out of catch rates seem reasonable.
	Middle	Fair	Very Good					
	Lower	Poor	Good					

Indicator	Reach	Current Rating	Desired Rating	Poor	Fair	Good	Very Good	Notes:
Blue Ribbon Fishery (BRF) Status	Upper	Fair	Very Good	The reach meets none of the five BRF criteria	The reach meets 1-2 BRF criteria.	The reach meets 3 - 4 BRF criteria.	The reach meets all five BRF criteria and is designated.	BRF criteria: 1) Water quality and quantity: a body of water, warm or cold, flowing or flat, will be considered for BRF status if it has sufficient water quality and quantity to sustain a viable fishery; 2) Water accessibility: the water must be accessible to the public; 3) Natural reproduction capacity: the body of water should possess a natural capacity to produce and maintain a sustainable recreational fishery. There must be management strategies that will consistently produce fish of significant size and/or numbers to provide a quality angling experience; 4) Angling pressure: the water must be able to withstand angling pressure; and 5) Specific species: selection may be based on a specific species.
	Middle	Good	Very Good					
	Lower	Poor	Good					
Adverse Impacts to Private Property from Public Recreation	Upper	Fair	Very Good	Heavy littering and vegetation trampling. Fences damaged repeatedly. Gates frequently left open. Trespass on private property is common. Issues are not sufficiently addressed by local government.	Moderate littering and vegetation trampling. Fences occasionally damaged and/or gates left open. Trespass on private property noted. Issues are not addressed by local government in a timely manner.	Few problems with litter, vegetation damage, and fence damage infrequent. Gates rarely left open. Trespass infrequent. Issues are addressed by local government.	Littering uncommon and regularly cleaned-up. Vegetation damage and fence damage infrequent. Gates rarely left open. Trespass infrequent. Issues are promptly addressed by local government.	Upper Reach: In the CAP residents' survey (Nov. 2015), some upper reach residents complained about recreationist parking and problems with trespass. Thirty-six percent indicated some level of negative impact from public use of the river. Middle Reach: Increased trespass apparent between Main and Golf Course Rd (Fair). Golf Course Rd. to 600 West (Very Good); 600 W. to 1000 West increased trespass on bank right no change on bank left (Fair). Lower Reach: stakeholder meeting with agricultural community representatives (11/30/15) supported a current condition of Fair. Existing public access is limited and there is little or no public information about where the public can (and should not) access the river. Landowners see evidence of boating groups taking out at various locations and crossing farm ground. Gates are occasionally left open and/or fences damaged. Littering was noted to occur. Condition could quickly become poor if river access (debris clearing, trail extension) is improved in the absence of actions to better direct the public and address trespass issues.
	Middle	Fair	Very Good					
	Lower	Fair	Very Good					

Indicator	Reach	Current Rating	Desired Rating	Poor	Fair	Good	Very Good	Notes:
Adverse Impacts to Private Property from River Restoration Actions	Upper	Fair	Very Good	Changes to Logan River for hydrologic or biological improvement result in significant damages (flooding, erosion, reduced agricultural productivity, etc.)	Changes to Logan River for hydrologic or biological improvement result in minor damages (flooding, erosion, reduced agricultural productivity, etc.)	Changes to Logan River for hydrologic or biological improvement result in minor benefits to private property (reduced flooding or easement for floodzone, reduced bank erosion, sustained or improved agricultural productivity, etc.)	Changes to Logan River for hydrologic or biological improvement result in significant benefits to private property (reduced flooding or easement for floodzone, reduced bank erosion, sustained or improved agricultural productivity, etc.)	Anticipated effects to private property should be considered in design and discussed with property owners. Unanticipated effects should be monitored, discussed with landowners, and mitigated to the extent practicable. Landowners also need to be aware of how their actions, such as bank stabilization, may affect others downstream.
	Middle	Fair	Very Good					
	Lower	Fair	Good					

Indicator	Attribute Rationale	Objectives	Issues/Concerns/Threats	Strategic Actions
Flow Regime (Spring Peak Flows)	Natural flow regime is important for maintaining channel capacity and habitat conditions	Maintain natural/historical hydrograph for channel maintenance purposes	1) New water development project diverting or storing spring snowmelt 2) Climate change (transition from snow to rain dominate precipitation)	1) Evaluate water development projects which would significantly affect peak flows 2) Evaluate the cumulative effects of any future water development projects with respect to climate change
Flow Regime (Summer Base Flow)	Summer base flows are critical for maintaining good water quality and a functional aquatic ecosystem	1) Decrease summertime water temperatures lethal to cold water species 2) Increase dissolved oxygen concentrations 3) Connect aquatic habitats throughout reach	Low summer flows	1) Help secure and manage instream flows recognizing existing water rights 2) Participate with governmental and non-governmental organizations that would find and manage water for instream flows 3) Evaluate the instream flow initiatives and potentially support the formation of a water conservancy district

Indicator	Attribute Rationale	Objectives	Issues/Concerns/Threats	Strategic Actions
Flood Conveyance Through Reach	Flooding risk to private and public property is assessed using this indicator	Reduce frequency of flooding events affecting private property	**Upper Reach:** 1) Encroachment of floodway by development and channel alterations 2) Encroachment onto public property 3) Lack of connection with floodplains 4) Lack of space for channel migration when accumulations of sand/gravel occur 5) Backwater and flooding impacts caused by Crockett Diversion 6) Materials used for bank stabilization (I.e. concrete, boulders, etc.) fail and accumulate in channel **Middle Reach:** 1) Encroachment of floodway by development and channel alterations 2) Encroachment onto public property 3) Lack of connection with floodplains 4) Lack of space for channel migration when accumulations of sand/gravel occur 5) Accumulation of sand/gravel and woody debris 6) Materials used for bank stabilization (I.e. concrete, boulders, etc.) fail and accumulate in channel **Lower Reach:** 1) Accumulation of sand/gravel and woody debris 2) Materials used for bank stabilization (I.e. concrete, old cars, etc.) fail and accumulate in channel 3) Lack of space for channel migration when accumulations of sand/gravel occur	Use an adaptive approach to improve flood conveyance through a combination of the following actions: 1) Determine existing sand, gravel, and woody debris transport and/or accumulation rates 2) Provide space for sand/gravel accumulations within the active floodplain such that channel capacity is maintained through natural bar development/meander migration processes. Methods for providing space include removal of floodplain encroachment and levees as well as through purchasing floodway easements or land acquisitions 3) Remove channel constrictions and over-accumulations of downed woody debris within floodplain 4) Design pressure relief points for sediment accumulation 5) Inform public of necessity of obtaining a state stream alteration permit before taking actions 6) Conduct municipal or county review of state stream alteration applications (Logan City Engineer to coordinate with DWQ Watershed Coordinator and DWR Habitat Manager to request that stream alteration permit applications be forwarded to local governments for comments related to goals and objectives from the CAP)

Indicator	Attribute Rationale	Objectives	Issues/Concerns/Threats	Strategic Actions
Floodplain Function	Functioning floodplains provide a variety of services including flood control, water quality/filtration, and wildlife habitat	Improve floodplain function	**Upper Reach:** 1) Encroachment of floodway by development and channel alterations 2) Channelization and unnatural bank stabilization practices **Middle Reach:** 1) Encroachment of floodway by development and channel alterations 2) Channelization and unnatural bank stabilization practices 3) Lack of connection with floodplains **Lower Reach:** 1) Encroachment of floodway by development and channel alterations 2) Channelization and unnatural bank stabilization practices 3) Lack of connection with floodplains	Use an adaptive approach to improve floodplain function through a combination of the following actions: 1) Provide stream channel and floodplain guidance (best management practices) for property owners and municipalities 2) Support public riparian planting and bank treatment workshop 3) Remove/pull back fill and levees that disconnect the channel from the floodplain wherever possible 4) Restore banks wherever possible that are lined with unnatural materials (concrete rubble, cars, walls, etc.) 5) Increase public awareness and enforcement of Logan City floodplain and riparian vegetation ordinances 6) Enable floodplain function through ordinance, easements, or acquisition
Instream Habitat	Instream habitat is important aesthetically and critical for all aquatic species living in the river	Restore instream habitats in the Logan River	1) Channelization and unnatural bank stabilization practices 2) Low summer flows 3) Poor water quality 4) Fish migration barriers 5) Lack of local oversight of state stream alteration permits 6) Lack of Logan City floodplain ordinance enforcement	1) Provide stream channel guidance (best management practices) for property owners and municipalities 2) Promote "net-gain" habitat improvement philosophy into any future channel projects 3) Construct and maintain diverse instream habitat, including stable woody materials 4) Conduct municipal or county review of state stream alteration applications (Logan City Engineer to coordinate with DWQ Watershed Coordinator and DWR Habitat Manager to request that stream alteration permit applications be forwarded to local governments for comments related to goals and objectives from the CAP) 5) Educate citizens regarding best management practices within floodplain (for example, by distributing the Riparian Planting Guide and workshops)

Indicator	Attribute Rationale	Objectives	Issues/Concerns/Threats	Strategic Actions
State Water Quality Standards for All UDEQ Beneficial Uses	Clean water is aesthetically pleasing and critical for all aquatic species living in the river	Maintain high water quality year round	1) Low summer flows 2) Poor water quality 3) Sediment releases from First Dam 4) Loss and fragmentation of native, multi-layered riparian vegetation	1) Help secure and manage instream flows recognizing existing water rights 2) Promote native vegetation planting program on all properties to transition vegetation towards native species 3) Oppose damaging sediment releases from First Dam maintenance operations
Trout Density & Size	Brown trout are the existing, dominant game fish in the river and the primary draw for anglers. Larger trout are important to high-quality fishing experiences to residents and visitors	Increase proportional stock density of salmonids	1) Lack of diverse habitat for desired species 2) Simplification of habitat by dredging 3) Poor water quality 4) Low summer flows 5) Sediment releases from First Dam	1) Construct and maintain diverse instream habitat, including stable woody materials 2) Ensure sufficient summer base flow for fish survival 3) Ensure water quality is sufficient for fish survival 4) Oppose damaging sediment releases from First Dam maintenance operations
Benthic Invertebrates Observed/Expected (UTDEQ Predictive Model)	Diverse invertebrate species composition is indicative of a healthy riverine system	Increase diversity of benthic invertebrates	1) Lack of diverse habitat for desired species 2) Low summer flows 3) Poor water quality 4) Sediment releases from First Dam 5) Effects of First Dam on daily temperature variations (upper reach)	1) Construct and maintain diverse instream habitat, including stable woody materials 2) Ensure sufficient summer base flow for desired species survival 3) Oppose damaging sediment releases from First Dam maintenance operations 4) Work with State and academic experts to determine other strategic actions

Indicator	Attribute Rationale	Objectives	Issues/Concerns/Threats	Strategic Actions
Riparian Vegetation Condition	Natural riparian vegetation provides a variety of important riverine functions	Move floodplain riparian vegetation toward a more natural condition	1) Channelization and unnatural bank stabilization practices 2) Loss and fragmentation of native, multi-layered riparian vegetation	1) Educate citizens regarding best management practices within floodplain (for example, by distributing the Riparian Planting Guide and workshops) 2) Promote native vegetation planting program on all properties to transition vegetation towards native species 3) Provide stream channel and floodplain guidance (best management practices) for property owners and municipalities 4) Increase public awareness and enforcement of Logan City floodplain and riparian vegetation ordinances 5) Control undesirable and non-native vegetation (beyond official noxious weeds list)
Cache County Noxious Weeds	Noxious weeds compete with native vegetation and reduce habitat for native animals	Reduce prevalence of weeds and prevent new infestations	1) Upstream and within watershed noxious weed seed sources 2) Lack of funding	1) Promote weed control within river corridor and watershed 2) Encourage native vegetation planting along river corridor 3) Education citizens regarding noxious weeds and treatment (distribute Riparian Planting Guide, workshops) 4) Provide environmental education along river trails
Bird Species Richness and Diversity	Birds are an important aesthetic component of the Logan River and indicator of ecosystem health. Birders contribute to local economies by feeding birds, buying equipment, and purchasing travel-related items.	Increase avian diversity	1) Loss and fragmentation of native, multi-layered riparian vegetation 2) Lack of invertebrate food source	1) Promote native vegetation planting program on all properties to transition vegetation towards native species 2) Construct and maintain diverse instream habitat, including stable woody materials 3) Conserve important nesting/foraging features of diverse riparian habitat (e.g. snags) 4) Develop diversity/richness monitoring strategy

Indicator	Attribute Rationale	Objectives	Issues/Concerns/Threats	Strategic Actions
Amphibians and Reptiles	Amphibians and reptiles are an important aesthetic component of the Logan River and indicator of ecosystem health.	Maintain or increase native amphibian and reptile density	1) Destruction of hibernation sites 2) Erosion and sedimentation 3) Loss of riparian habitat to development and river channelization 4) Poor water quality 5) Predation by bullfrogs	1) Maintain or improve riparian habitat and wetlands 2) Encourage homeowners to create habitat, such as fishless ponds with native vegetation 3) Encourage homeowners to tolerate snakes on their property
Trail Continuity	Even small breaks in trail systems can prevent widespread trail use and/or have potential for injury to trail users and to cause trespass	Expand trail system to connect existing and planned trails, parks, and river access locations	1) Lack of public space for river access 2) Lack of funding	1)Work with Logan Parks and Recreation Advisory Board 2) Identify gaps in existing trail system 3) Determine best opportunity to connect existing trail system 4) Enable trail connectivity through ordinance, easements, or acquisition 5) Construct new trail segments 6) Remove barriers to existing trails connectivity 7) Determine and provide a Main Street crossing (pedestrian crossing light, bridge, underpass, etc.)
Legal Access To River Bed (wading)	1) River access is important for public uses of river 2) Help prevent private property impacts such as trespass	Enable public river access at appropriate locations	1) Legal riverbed access may change due to state law (Public Trust Doctrine) 2) Poor etiquette (noise, trash, trespass, etc.) 3) Future urban development and enclosure of riverway	1) Develop appropriate facilities (parking especially) to support public access 2) Acquire property or easements for access 3) Provide public education, such as legal access map and appropriate river behavior

Indicator	Attribute Rationale	Objectives	Issues/Concerns/Threats	Strategic Actions
Legal Access To River Bank (above high-water line)	1) River access is important for public uses of river 2) Help prevent private property impacts such as trespass	Enable public river access at appropriate locations	1) Lack of public space for river access 2) Poor etiquette (noise, trash, trespass, etc.) 3) Future urban development and enclosure of riverway	1) Work with city and county to build or improve facilities to enable public use of the river 2) Enable river access through ordinance, easements, or acquisition 3) Provide public education, such as legal access map and appropriate river etiquette
Access facilities (pedestrian/ADA access points, parking, boat launches, kayak parks)	Logan River is a public amenity and should have appropriate facilities to enable access and use	Expand and maintain public spaces and facilities along river	1) Lack of public space for river access 2) Landowner opposition to new public facilities	1) Work with city and county to build or improve facilities to enable public use of river 2) Address private property concerns (see strategic actions for adverse impacts to private property from public recreation)
Fishing success/catch rate of Salmonids (Brown Trout and Whitefish)	Fishing success/catch rates are important for the angler experience	Sufficiently high catch rates to satisfy anglers	1) Lack of diverse habitat for desired species 2) Low summer flows 3) Poor water quality	1) Construct and maintain diverse instream habitat, including stable woody materials 2) Ensure sufficient summer base flow for desired species survival 3) Ensure water quality is sufficient for fish survival 4) Oppose damaging sediment releases from First Dam maintenance operations
Blue Ribbon Fishery (BRF) Status	High-quality fishing experiences are important to residents and visitors	Obtain BRF status	1) Lack of public space for river access 2) Lack of diverse habitat for desired species 3) Low summer flows 4) Poor water quality	1) Construct and maintain diverse instream habitat, including stable woody materials 2) Ensure sufficient summer base flow for desired species survival 3) Ensure water quality is sufficient for fish survival 4) Work with city and county to build or improve facilities to enable public use of the river 5) Enable river access through ordinance, easements, or acquisition

Indicator	Attribute Rationale	Objectives	Issues/Concerns/Threats	Strategic Actions
Adverse Impacts to Private Property from Public Recreation	Acknowledging private property along river channel is a top priority	Avoid and mitigate public recreation impacts on private property	1) Lack of public space for river access 2) Poor etiquette (noise, trash, trespass, etc.)	1) Include facilities (i.e. designated access locations, parking, signage, fences, law enforcement) which reduce incidence of property trespass 2) Provide and maintain trash collection facilities and public education to reduce litter 3) Local government to work with landowners and state agencies to implement a coordinated walk-in access program 4) Provide public education, such as legal access map and appropriate river etiquette
Adverse Impacts to Private Property from River Restoration Actions	Changes to flood conveyance and the riparian corridor could have anticipated or unanticipated consequences for adjacent private properties	Avoid and mitigate impacts from CAP on private property	1) Unintended consequences from actions 2) Lack of funding	1) Facilitate early public involvement in river restoration projects 2) Implement well-designed river restoration projects based on the CAP 3) Conduct follow-up public involvement to evaluate project success, identify issues that warrant resolution, and improve future projects