



Missouri
Department of
Natural Resources

DRAFT

**Missouri Aquatic Habitat Use Attainability Analyses:
Stream Survey and Assessment Protocol**

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1 Purpose

This Missouri Aquatic Habitat Use Attainability Analysis protocol is intended as guidance for any party interested in conducting investigations to provide scientifically defensible information on existing and attainable warm water aquatic life uses of waters included in Missouri's Water Quality Standards at Tables G and H, and in the Missouri Use Designation Dataset (referenced at 10 CSR 20-7.031(2)(E)). These waters are afforded specific protections by regulation and are subject to numeric and narrative criteria and antidegradation requirements to protect water quality and designated uses. Information and data obtained using the guidance presented in this document will be used to:

- Comply with federal requirements for the designation of aquatic life uses,
- Assist in identifying waters of the State which support aquatic life uses,
- Assist in identifying waters of the State which do not support aquatic life uses,
- Respond to changes in the capacity of surface waters to support aquatic life uses, and/or
- Review and modify, as appropriate, the aquatic life use designation of surface waters.

The following framework offers factors to consider and, in some cases, minimum requirements necessary for conducting a Use Attainability Analysis (UAA) to identify the highest attainable aquatic habitat designated use and, where applicable, address the removal or revision of such use. Recognizing that no two circumstances, or streams, may be identical, the intent is to establish a set of guidelines, rather than a prescriptive, one-size-fits-all approach. The processes and procedures in this document have been drafted to ensure defensibility and confidence in the UAA process and provide a structured and scientific framework for designated use determinations. A UAA must satisfy certain criteria, and adherence to the processes and procedures outlined in this document will help ensure that UAAs are complete and approvable by the department. However, it is not required that these guidelines be followed, and the department will accept for consideration any complete UAA that has been conducted using alternate methods. Parties wishing to use alternate methods for conducting UAAs are encouraged to contact the department early in the process.

2 Applicable Laws and Regulations

Following are several key federal and state laws and regulations applicable to water quality standards. They are included to help clarify the regulatory basis for beneficial use designation and use attainability analyses.

2.1 Federal Water Pollution Control Act

Sections 101(a) and 303(c) of the Federal Water Pollution Control Act (Clean Water Act) establish a "rebuttable presumption" that "fishable/swimmable" uses are attainable and should apply to a water body unless it is affirmatively demonstrated that such uses are not attainable.

§ 101(a)(2):

It is the national goal that wherever attainable, an interim goal of water quality which provides for the protection and propagation of fish, shellfish and wildlife and provides for recreation in and on the water be achieved by July 1, 1983.

§ 303(c)(2)(A):

Whenever the State revises or adopts a new standard, such revised or new standards shall be submitted to the Administrator. Such revised or new water quality standard shall consist of the designated uses of the navigable waters involved and the water quality criteria for such waters based upon such uses. Such standards shall be such as to protect the public health or welfare, enhance the quality of water and serve the purposes of this Act. Such standards shall be established taking into consideration their use and value for public water supplies, propagation of fish and wildlife, recreational purposes, and agricultural, industrial, and other purposes, and also taking into consideration their use and value for navigation.

2.2 Code of Federal Regulations

Title 40 Part 131 of the Code of Federal Regulation addresses Water Quality Standards, and establishes the State's role in designating, revising, or removing uses for water bodies, including suggestions for categories of use classifications.

§ 131.10(a):

Each State must specify appropriate water uses to be achieved and protected. The classification of the waters of the State must take into consideration the use and value of water for public water supplies, protection and propagation of fish, shellfish and wildlife, recreation in and on the water, agricultural, industrial, and other purposes including navigation. In no case shall a State adopt waste transport or waste assimilation as a designated use for any waters of the United States.

§ 131.10(h):

States may not remove designated uses if:

- (1) They are existing uses, as defined in §131.3, unless a use requiring more stringent criteria is added; or*
- (2) Such uses will be attained by implementing effluent limits required under sections 301(b) and 306 of the Act and by implementing cost-effective and reasonable best management practices for nonpoint source control.*

§ 131.10(i):

Where existing water quality standards specify designated uses less than those which are presently being attained, the State shall revise its standards to reflect the uses actually being attained.

A Use Attainability Analysis to justify deviation from the Clean Water Act “fishable/swimmable” use designations is defined, and provisions for the establishment of a UAA are set forth. This provision can be found at 40 CFR § 131.10(j):

§ 131.10(j):

A State must conduct a use attainability analysis as described in §131.3(g) whenever:

- (1) The State designates or has designated uses that do not include the uses specified in section 101(a)(2) of the Act; or*
- (2) The State wishes to remove a designated use that is specified in section 101(a)(2) of the Act or to adopt subcategories of uses specified in 101(a)(2) of the Act which require less stringent criteria.*

The federal definition of Use Attainability Analysis, as referenced at 40 CFR § 131.10(j), can be found at 40 CFR § 131.3(g):

§ 131.3(g):

Use attainability analysis is a structured scientific assessment of the factors affecting the attainment of the use which may include physical, chemical, biological, and economic factors as described in §131.10(g).

States may establish subcategories of a use or remove a designated use that is not an existing use, if it can be demonstrated that attaining the designated use is infeasible. Federal regulation at 40 CFR § 131.10(g) identifies the factors that must be considered in making such a demonstration:

§ 131.10(g):

States may remove a designated use which is not an existing use, as defined in §131.3, or establish sub-categories of a use if the State can demonstrate that attaining the designated use is not feasible because:

- (1) Naturally occurring pollutant concentrations prevent the attainment of the use; or*
- (2) Natural, ephemeral, intermittent or low flow conditions or water levels prevent the attainment of the use, unless these conditions may be compensated for by the discharge of sufficient volume of effluent discharges without violating State water conservation requirements to enable uses to be met; or*
- (3) Human caused conditions or sources of pollution prevent the attainment of the use and cannot be remedied or would cause more environmental damage to correct than to leave in place; or*
- (4) Dams, diversions or other types of hydrologic modifications preclude the attainment of the use, and it is not feasible to restore the water body to its original condition or to operate such modification in a way that would result in the attainment of the use; or*
- (5) Physical conditions related to the natural features of the water body, such as the lack of a proper substrate, cover, flow, depth, pools, riffles, and the like, unrelated to water quality, preclude attainment of aquatic life protection uses; or*

(6) Controls more stringent than those required by sections 301(b) and 306 of the Act would result in substantial and widespread economic and social impact.

2.3 Missouri Clean Water Law and Water Quality Standards

The Missouri Clean Water Law (Section 644, Missouri Revised Statutes (RSMo)) and the Water Quality Standards (10 CSR 20-7.031) establish water quality goals for all waters of the State.

Missouri's Water Quality Standards regulation at 10 CSR 20-7.031(1)(C) provides for the "protection and propagation of fish, shellfish and wildlife". Designated uses of waters of the State are identified in the Missouri Use Designation Dataset and in Tables G and H of 10 CSR 20-7.031. All waters in the Use Designation Dataset and in Tables G and H are presumed to support aquatic life unless a UAA has demonstrated that the use is not attainable. The use designation for aquatic life may be removed or modified through a UAA for only those waters where aquatic life protection is not an existing use, consistent with 40 CFR § 131.10(h).

Aquatic life designated uses include:

Warm Water Habitat (WWH)—Waters in which naturally-occurring water quality and habitat conditions allow the maintenance of a wide variety of warm-water biota.

Cool Water Habitat (CLH)—Waters in which naturally-occurring water quality and habitat conditions allow the maintenance of a wide variety of cool-water biota. These waters can support a sensitive, high-quality sport fishery (i.e., smallmouth bass and rock bass).

Cold Water Habitat (CDH)—Waters in which naturally-occurring water quality and habitat conditions allow the maintenance of a wide variety of cold-water biota. These waters can support a naturally reproducing or stocked trout fishery and populations of other cold-water species.

Ephemeral Aquatic Habitat (EAH)—Waters having surface flow or pools in response to precipitation events or snow melt, but without permanent surface flow or permanent pools; naturally-occurring water quality and habitat conditions may allow the maintenance of a limited or transient community of aquatic biota.

Modified Aquatic Habitat (MAH)—Waters in which naturally-occurring water quality and/or habitat conditions have been physically, chemically or biologically modified and may prevent the maintenance of a wide variety or diversity of aquatic biota.

Limited Aquatic Habitat (LAH)—Waters in which naturally-occurring water quality and/or habitat conditions have been substantially or irretrievably altered; water quality and habitat conditions do not allow maintenance of aquatic biota, or if present, the community is of poor variety or diversity.

3 Conditions for Conducting a Use Attainability Analysis

The *Missouri Aquatic Habitat Use Attainability Analyses: Stream Survey and Assessment Protocol* has been developed to provide scientifically defensible process that will enable the department to make accurate determinations of existing and attainable aquatic habitat uses. The following framework offers factors to consider and minimum requirements necessary for conducting a UAA to identify the highest attainable aquatic habitat designated use and, where applicable, address the removal or modification of such use.

3.1 Removal of Designated Uses

In order to propose the **removal** of any and all designated aquatic habitat uses on a particular water body through a UAA, an interested party would be required to:

1. submit for department review and approval a structured, comprehensive and scientifically-defensible biological assessment to demonstrate that *no* aquatic life exists in the stream under a range of seasons and flow conditions, and
2. demonstrate with a structured scientific assessment why it is not possible or feasible to *attain* any aquatic habitat designated use, based on one or more of the six factors identified in 40 CFR § 131.10(g).

3.2 Revision of Designated Uses

In order to propose **revising** a designated aquatic habitat use on a particular water body through a UAA, an interested party would be required to:

1. submit for department review and approval a structured, comprehensive and scientifically-defensible biological assessment to identify the highest (most protective) aquatic habitat use currently being attained in the stream under a range of seasons and flow conditions, and
2. if this highest use being attained is lower than (less protective of) the current designated use for that water, demonstrate with a structured scientific assessment why it is not possible or feasible to attain the designated aquatic habitat use, based on one or more of the six factors identified in 40 CFR § 131.10(g), and
3. if this highest use being attained is higher than (more protective of) the current designated use for that water, then the State shall revise its standards to reflect the use actually being attained, consistent with 40 CFR § 131.10(i).

3.3 Biological Assessment

The first step in demonstrating use attainability is to identify the highest attainable aquatic habitat use, or lack of attainable use, as appropriate. A structured, comprehensive and scientifically-defensible biological assessment would, at a minimum:

1. include a department-approved Quality Assurance Project Plan (QAPP);
2. include biological surveys for fish and macroinvertebrates (including mussels) to be conducted a minimum of one time each during the appropriate sampling periods, taking into consideration life cycles and species distribution.

3. be conducted at a set of survey locations that are most representative of the characteristics of the subject water body as a whole;
4. be conducted when there is water in the stream, or be able to demonstrate that pools in the stream are ephemeral in nature;
5. follow established or other well-defined biological monitoring protocol(s), including but not limited to:
 - a. MDNR's *Project Procedure: Semi-quantitative Macroinvertebrate Stream Bioassessment*,
 - b. MDNR's *Standard Operating Procedure: Taxonomic Levels for Macroinvertebrate Identification*,
 - c. Missouri Department of Conservation's *Resource Assessment and Monitoring Program: Standard Operating Procedures – Fish Sampling*,
 - d. EPA's *Technical Support Document for Conducting and Reviewing Freshwater Mussel Occurrence Surveys for the Development of Site-specific Water Quality Criteria for Ammonia*;
6. identify least-disturbed reference streams with similar physical characteristics to compare to subject stream. Potential sources for reference streams include, but are not limited to:
 - a. 10 CSR 20-7.031 Table I, Biocriteria Reference Locations,
 - b. Missouri Use Designation Dataset,
 - c. MoRAP's Aquatic GAP Project.

See Section 4.4 Biological Assessment – Field Survey Procedures, for additional information.

3.4 UAA Factors

Once it has been demonstrated through a structured, comprehensive and scientifically-defensible biological assessment that either no aquatic habitat use exists, or a particular aquatic habitat use is not attainable for this water body, an explanation or justification for this lack of use attainability must be provided, based on one or more of the following factors.

40 CFR § 131.10(g)

States may remove a designated use which is not an existing use, as defined in §131.3, or establish sub-categories of a use if the State can demonstrate that attaining the designated use is not feasible because:

(1) Naturally occurring pollutant concentrations prevent the attainment of the use.

The Use Attainability Analysis must, at a minimum:

- a. include a department-approved Quality Assurance Project Plan (QAPP) to address the collection of water quality data;
- b. identify the naturally-occurring pollutant(s) preventing attainment of the use;
- c. quantify the concentrations and duration of naturally-occurring pollutant(s);
- d. consider all potential sources of the pollutant being evaluated;
- e. identify geologic or other conditions that cause natural pollutant loading;

- f. demonstrate that the pollutant(s) is/are strictly naturally occurring, and demonstrate how anthropogenic sources were determined not to be sources of pollutant loading.

(2) Natural, ephemeral, intermittent, or low flow conditions or water levels prevent the attainment of the use, unless these conditions may be compensated for by the discharge of sufficient volume of effluent discharges without violating State water conservation requirements to enable uses to be met.

The Use Attainability Analysis must, at a minimum:

- a. identify geologic, hydrogeomorphic, or other natural conditions that cause ephemeral, intermittent or low-flow conditions;
- b. demonstrate that these natural flow condition(s) are what prevents attainment of the designated aquatic habitat use;
- c. be conducted during normal, seasonal weather conditions, and not be conducted during abnormally dry or drought conditions;
- d. contain a thorough characterization of stream geomorphology, including in-stream habitat and channel dimensions;
- e. identify stream flow class based on presence and characteristics of pools:

(3) Human caused conditions or sources of pollution prevent the attainment of the use and cannot be remedied or would cause more environmental damage to correct than to leave in place.

The Use Attainability Analysis must, at a minimum:

- a. identify human-caused pollutant(s) or condition(s) affecting the stream;
- b. quantify the extent of anthropogenic conditions, or the concentrations and duration of anthropogenic pollutant(s) preventing attainment of the use;
- c. identify the source(s) of human-caused pollutant(s) or condition(s) affecting the stream;
- d. demonstrate that it is these human-caused pollutant(s) or condition(s) that prevent attainment of use;
- e. demonstrate why these human-caused pollutant(s) or condition(s) cannot be remedied;
- f. demonstrate that these human-caused pollutant(s) or condition(s) would cause more environmental damage to correct than to leave in place.

(4) Dams, diversions or other types of hydrologic modifications preclude the attainment of the use, and it is not feasible to restore the water body to its original condition or to operate such modification in a way that would result in the attainment of the use.

The Use Attainability Analysis must, at a minimum:

- a. identify any and all hydrologic modification(s) affecting the stream;
- b. demonstrate that it is these hydrologic modifications that prevent attainment of the designated aquatic habitat use;
- c. demonstrate that it is not feasible to restore the water body to its natural condition;

- d. demonstrate that it is not feasible to operate the modification in a way that result in attainment of the use.

(5) Physical conditions related to the natural features of the water body, such as the lack of a proper substrate, cover, flow, depth, pools, riffles, and the like, unrelated to water quality, preclude attainment of aquatic life protection uses.

The Use Attainability Analysis must, at a minimum:

- a. thoroughly characterize naturally-occurring geologic, geomorphic or other physical characteristics of the stream, including but not limited to:
 - i. stream geomorphology, including in-stream habitat and channel dimensions,
 - ii. stream flow class based on presence and characteristics of pools:
- b. demonstrate that physical features of the water body are what prevents attainment of the designated aquatic habitat use;
- c. demonstrate that these physical features of the water body are naturally-occurring.

(6) Controls more stringent than those required by sections 301(b) and 306 of the Act would result in substantial and widespread economic and social impact.

The Use Attainability Analysis must, at a minimum:

- a. identify the anthropogenic source(s) of pollutant(s) affecting attainment of the designated aquatic habitat use, and differentiate between:
 - i. Privately vs. publicly owned, and
 - ii. Point vs. nonpoint source;
- b. conduct a financial analysis to determine if the capital and the operating and maintenance costs of pollution control will have a substantial financial impact and, if so, calculate the degree of this impact;
- c. conduct an assessment of what, if any, far-reaching and serious impacts to the community would likely result from the financial impacts;
- d. follow an established or other well-defined protocol for addressing economic and social impacts of water quality standards, such as, but not limited to:
 - i. EPA's *Interim Economic Guidance for Water Quality Standards Workbook* (EPA 823-B-95-002),
 - ii. EPA's *Combined Sewer Overflows—Guidance for Financial Capability* (EPA 832-B-97-004).

See Section 4.5 Use Attainability – Habitat Assessment for additional information.

4 Missouri Aquatic Habitat UAA Survey Procedures

The following section offers resources and guidelines by which Aquatic Habitat UAAs should be initiated, conducted, and completed in Missouri. The processes and procedures in this section have been drafted to ensure defensibility and confidence in the UAA process and provide a structured and scientific framework for designated use determinations. While it is not required

that any or all of these guidelines are to be followed, adherence to these policies and procedures will help ensure UAAs that are complete and acceptable to the department.

All aquatic habitat UAAs must, at a minimum, include the following information:

1. Identification
 - a. Water body name (if applicable)
 - b. Missouri water body identification number (WBID)
 - c. Segment I.D.(s) (from the Missouri Use Designation Dataset)
 - d. Date and time of UAA survey
2. Location/Environment
 - a. County(ies), listed downstream to upstream
 - b. 8-digit HUC watershed
 - c. Downstream and upstream UTM coordinates (Easting/Northing)
 - d. Survey site numbers, listed downstream to upstream
 - e. Water body location map
 - f. Surrounding land use
 - g. Weather conditions for previous 15 days
3. Photographs of water body, including:
 - a. Photo I.D. number
 - b. Water body identification
 - c. Photo location and direction
 - d. Purpose of photo
4. All permitted entities (if applicable) whether discharging or not, including:
 - a. Name
 - b. Geographic location
 - c. Missouri State Operating Permit number
5. UAA Surveyors
 - a. Company/organization name
 - b. Name(s) of field team members
 - c. Contact information (address, phone number)

4.1 UAA Pre-Assessment Meeting

Any party wishing to conduct a UAA is strongly encouraged to meet with department staff and present a Pre-Assessment Plan for department review before beginning data collection. While not required, a planning meeting would allow both parties to discuss issues, strategies and minimum requirements for a successful UAA, and help ensure a smooth and timely department review of the UAA. Interested parties are strongly encouraged to schedule this meeting with the department at least 30 days before the scheduled survey date. Any significant deviation from the Pre-Assessment Plan during UAA development should be noted in the UAA Report (See Section 4.5, "UAA Report Submission").

4.2 UAA Pre-Assessment Plans

A Pre-Assessment Plan should include a statement of the issue and should identify the water body as it appears in 10 CSR 20-7.031, Table G or H or the Missouri Use Designation Dataset. Although Pre-Assessment Plans are not required, the more information provided ahead of time, such as site description, maps, potential survey sites, adjacent landowners and surrounding land use, the more feedback the department can provide to ensure a successful UAA.

Any Pre-Assessment Plan should include a review of any biological data that have been collected, or biological assessments completed, on this water body segment. Identifying such data may prevent the UAA applicant from duplicating efforts, and may potentially save time and money.

The following information and resources are available from the department, and may be useful in developing Pre-Assessment Plans and UAAs:

1. 10 CSR 20-7.031 Missouri Water Quality Standards
(<http://www.dnr.mo.gov/env/wpp/wqstandards/index.html>)
(http://www.dnr.mo.gov/mocwis_public/waterQualityStandardsSearch.do)
2. Missouri State Operating Permitted facilities
(<http://www.dnr.mo.gov/env/wpp/permits/index.html>)
3. Biological Assessments
(<http://www.dnr.mo.gov/env/esp/wqm/biologicalassessments.htm>)
4. Volunteer Water Quality Monitoring Program
(<http://www.dnr.mo.gov/env/wpp/VWQM.htm>)
5. Online map viewers
(<http://www.dnr.mo.gov/env/wpp/wpp-map-gallery.htm>)
6. Water quality data
(http://www.dnr.mo.gov/mocwis_public/wqa/waterbodySearch.do)

Most spatial data for Missouri, including those published by the Missouri Department of Natural Resources, are available in digital format through the Missouri Spatial Data Information Service (MSDIS) at <http://msdis.missouri.edu/>. Other data may be available through the following sources:

- United States Geological Survey (USGS)
- Missouri Department of Natural Resources Regional Offices
- Center for Applied Research and Environmental Systems (CARES)
- Missouri Department of Conservation
- United States Fish & Wildlife Service
- United States Army Corps of Engineers
- Missouri Stream Team Program
- Local municipalities
- Local universities

4.3 UAA Quality Assurance Project Plans

Any UAA involving the collection of aquatic habitat, water quality or biological data as part of the study process must include a department-approved Quality Assurance Project Plan (QAPP) that documents the project's quality assurance procedures and quality control specifications. This QAPP must be completed and approved prior to initiation of data collection. The department recommends that any QAPP follow EPA guidance found in *EPA Requirements of Quality Assurance Project Plans* (USEPA 2001).

4.4 Biological Assessment – Field Survey Procedures

If there are no previous biological assessments, or if previous assessments are inadequate for making a designated use determination, it will be necessary to document the aquatic life community through field assessments. Field assessments are best conducted by a qualified aquatic biologist, or other person trained in aquatic habitat evaluation, macroinvertebrate sampling or fish sampling. A qualified individual includes any person with appropriate post-secondary coursework in aquatic biology, aquatic ecology, aquatic invertebrate zoology, ichthyology, and/or limnology with field experience in the identification of aquatic and semiaquatic species native to Missouri.

The actual aquatic life use of a water body is defined by the resident biota, and the UAA can be accomplished using any major biological trophic levels; however, sampling normally focuses on two groups of organisms: fish and macroinvertebrates. After performing a biological inventory and calculating indices of biological health, one should be able to adequately describe the condition of the aquatic life in the water body.

Prior to any fish or macroinvertebrate collection activities, a scientific collector's permit must be obtained from Missouri Department of Conservation at the following website:

<http://mdc.mo.gov/permits/special-permits/breeder-and-collector-permits/wildlife-collectors-permit-and-report-forms>

A federal collector's permit is required if federally protected (threatened & endangered) species are likely to be encountered. The permit contact information for the U.S. Fish and Wildlife Service is:

U.S. Fish and Wildlife Service
Endangered Species Permit Office
5600 American Blvd. West
Suite 990
Bloomington, MN 55437-1458

Web: <http://www.fws.gov/midwest/Endangered/>

Phone: 612-713-5343

email: permitsR3ES@fws.gov

Fax: 612-713-5292

4.4.1 Field Reconnaissance

Field activities generally begin with a visual inspection of the targeted stream at multiple locations, typically bridge crossings or other available public access points. Those segments deemed most representative of the water body should be selected for further study. If a segment is believed to afford exceptional biological habitat, it can be included as an additional study location even if it is unrepresentative of the water body as a whole. This increases the likelihood that rare or unusual biological assemblages will be identified and assigned an appropriate level of protection under the water quality standards. Aquatic Life UAA reconnaissance should identify a minimum of three potential sampling locations, with the expectation that at least one site will best represent the assessment reach. The actual length of a stream reach selected for assessment should follow the criteria established in the respective biological assessment protocol (Combes 2011; MDNR 2010a).

4.4.2 Sampling Index Period

Sampling of fish communities should take into account the expected species distribution, as well as the life cycles of these species. Sampling should be conducted not only during the typical low flow period of June 1st through September 15th, but also during periods when early life stages may be expected.

Benthic macroinvertebrates, including mussels, should be sampled from mid-March to mid-April and mid-September to mid-October, which coincides with stable base flow conditions prior to peak aquatic insect emergence (Rabeni et al. 1997; MDNR 2010a).

4.4.3 Flow Conditions

In most cases, biological assessments should be conducted when there is water present in the stream. Field assessments on streams with groundwater-influenced intermittent or perennial flow should be conducted during normal base flow conditions. The aquatic community present during sampling reflects the frequency and magnitude of impact from low flows and other water quality problems. Where water or flow are not present in the stream, demonstrations as to the ephemeral nature of the water should be documented.

4.4.4. Weather Conditions

It is important to know and record the local weather conditions that occur before and during a UAA field survey. Precipitation events can have a significant effect on substrate scouring and resultant disruption of the aquatic community. Surveyors are therefore required to submit rainfall data for the 15 days prior to initiating fieldwork.

Aquatic Habitat UAAs should not be conducted during abnormally dry or drought conditions. Drought conditions for Missouri prevailing at the time of data collection must be documented and submitted. See the National Integrated Drought Information System's U.S. Drought Monitor (<http://www.drought.gov/drought/>).

4.4.5 Water Body Survey Sites

The length and location of the UAA survey must be representative of the entire water body segment as described in Table H of 10 CSR 20-7.031, or the Missouri Use Designation Dataset.

The UAA for each water body should generally identify at least three survey sites for every five miles of stream. For stream segments less than five miles in length, it is strongly recommended that a minimum of two biological samples be collected to complete an assessment. Biological sampling sites within less accessible stretches of the water body segment should be included in the survey if possible. Sites near temporary beaver dams, debris dams, and permitted discharges, should be avoided.

If there are large gaps in long stream segments, the reason(s) for the gaps should be documented. Sites must be numbered in a downstream to upstream order.

4.4.6 Macroinvertebrate Community Sampling Methodology

An established macroinvertebrate sampling protocol, *Project Procedure: Semi-quantitative Macroinvertebrate Stream Bioassessment* (MDNR 2010a), and taxonomic identification level standard operation procedure, *Standard Operating Procedure: Taxonomic Levels for Macroinvertebrate Identification* (MDNR 2010c), are available through the department's UAA web site <http://www.dnr.mo.gov/env/wpp/wqstandards/uaa/index.html>. These procedures are applicable to Headwater, Creek and Small River classifications. Given the nature of Large River and Great River water bodies, it is not anticipated that procedures to remove or modify an aquatic habitat use will be necessary.

In conducting a biological assessment, it will be important to consider the presence, abundance and species distribution of freshwater mussels in the UAA subject stream. EPA's *Technical Support Document for Conducting and Reviewing Freshwater Mussel Occurrence Surveys for the Development of Site-specific Water Quality Criteria for Ammonia* (USEPA 2013) is one guide that may be useful in designing and conducting such surveys.

4.4.7 Fish Community Sampling Methodology

An established fish sampling protocol, *Resource Assessment and Monitoring Program: Standard Operating Procedures – Fish Sampling* (Combes 2011), is available through the department's UAA web site <http://www.dnr.mo.gov/env/wpp/wqstandards/uaa/index.html>. These procedures are applicable to Headwater, Creek and Small River classifications. Given the nature of Large River and Great River water bodies, it is not anticipated that procedures to remove or modify an aquatic habitat use will be necessary.

4.4.8 Numeric Criteria

Macroinvertebrates – The process of developing numeric criteria has been established for macroinvertebrates in wadeable/perennial streams of Missouri (Sarver et. al 2002). The

wadeable/perennial designation can be considered to be equivalent to Small River and Creek sizes in Missouri's Water Quality Standards. Numeric macroinvertebrate criteria do not exist for Great Rivers, Large Rivers or most Headwater streams. Therefore, until numeric criteria can be established, macroinvertebrate data from these stream sizes should be interpreted through narrative criteria and reference communities established in conjunction with individual stream studies.

Fish – Numeric criteria have been established for wadeable/perennial streams in the Ozarks region (Doisy et. al 2008). The wadeable/perennial designation can be considered to be equivalent to Small River and Creek sizes in Missouri's Water Quality Standards. Numeric criteria do not exist for the Central Plains region, the Mississippi Alluvial Plains region, Large Rivers in the Ozark region, or Headwater streams in the Ozark region. Therefore, until numeric criteria can be established, fish data from these ecological regions and stream sizes must be interpreted through narrative criteria and reference communities established in conjunction with individual stream studies.

4.4.9 Narrative Criteria

Macroinvertebrate and fish communities in streams lacking numeric criteria will be interpreted by utilizing narrative language developed by the U. S. Environmental Protection Agency during research and development of the Biological Condition Gradient (USEPA 2005). Figure 1 specifies narrative criteria language for levels of biological condition and presents a generalized graphic representation of how the gradient would fit the Missouri Aquatic Habitat Use designations (Adapted from USEPA 2005).

Research is currently under way to replace narrative biological criteria with numeric biological criteria in stream classes lacking numeric criteria.

Figure 1
The Biological Condition Gradient: Biological Response to Increasing Levels of Stress

Levels of Biological Condition

Natural structural, functional, and taxonomic integrity is preserved.

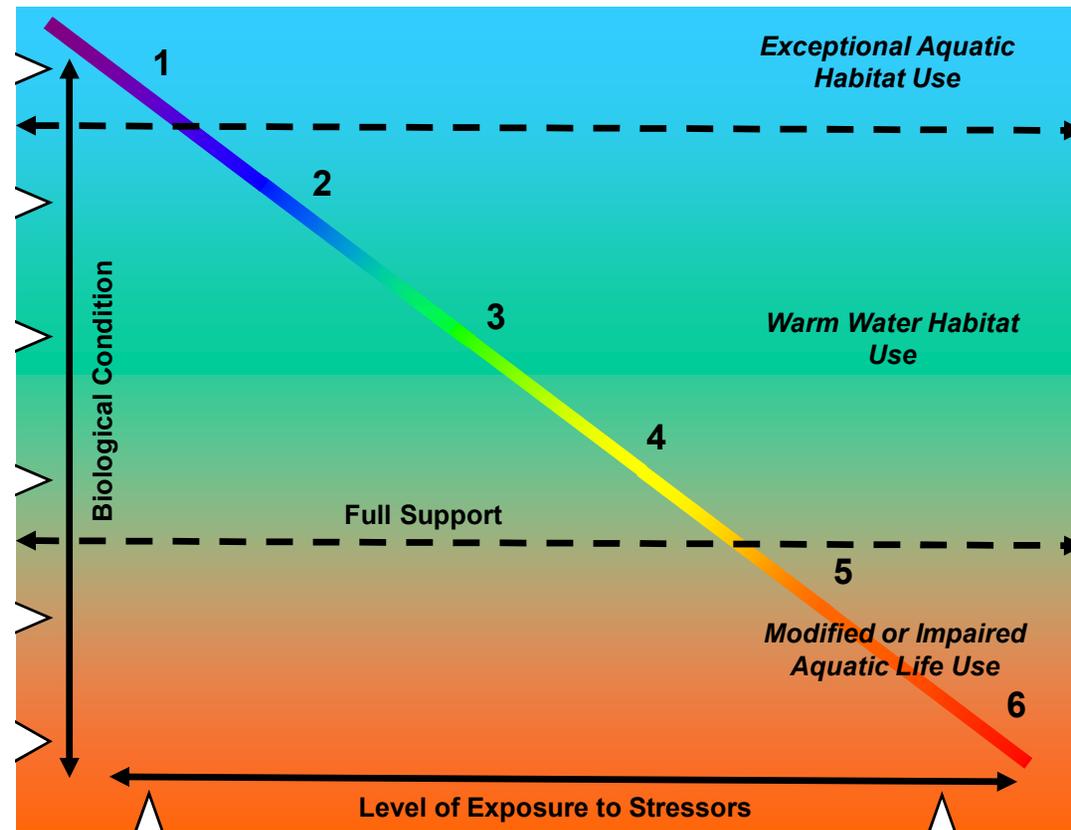
Structure & function similar to natural community with some additional taxa & biomass; ecosystem level functions are fully maintained.

Evident changes in structure due to loss of some rare native taxa; shifts in relative abundance; ecosystem level functions fully maintained.

Moderate changes in structure due to replacement of sensitive ubiquitous taxa by more tolerant taxa; ecosystem functions largely maintained.

Sensitive taxa markedly diminished; conspicuously unbalanced distribution of major taxonomic groups; ecosystem function shows reduced complexity & redundancy.

Extreme changes in structure and ecosystem function; wholesale changes in taxonomic composition; extreme alterations from normal densities.



Watershed, habitat, flow regime and water chemistry as naturally occurs.

Chemistry, habitat, and/or flow regime severely altered from natural conditions.

4.5 Use Attainability – Habitat Assessment

Once the biological assessment portion of the UAA establishes that a designated use is not attainable and that removal or revision of that use may be appropriate, a justification must be demonstrated based on one or more of the factors established in 40 CFR § 131.10(g).

The information necessary to make such a demonstration, and to provide for department review, is outlined in Section 3.4 of this document. The guidance offered below is an attempt to elaborate on that outline in an effort to ensure defensibility and confidence in the UAA process, and to provide a structured and scientific framework for designated use determinations. Adherence to these policies and procedures will help ensure UAAs that are complete and acceptable to the department.

It is the department's intent that this protocol address revision or removal of designated uses due to 40 CFR § 131.10(g) factors (1) through (5). For revision or removal of designated uses due to factor 40 CFR § 131.10(g)(6), substantial and widespread economic and social impact, please refer to EPA's *Interim Economic Guidance for Water Quality Standards* workbook and associated spreadsheet tools, or EPA's *Combined Sewer Overflows—Guidance for Financial Capability*, as useful tools for evaluating economic impacts.

4.5.1 Flow

According to the EPA, “the instream flow requirement for fish and wildlife is the flow regime necessary to maintain levels of fish, wildlife and other dependent organisms” (USEPA 1983). In order to determine that stream flow is the factor limiting attainment of the aquatic habitat use, the hydrology of the stream, whether natural or human-influenced, must be accurately characterized over a range of seasons and conditions. This includes not only measures of actual flow, but also duration, frequency and size of pool features in the stream.

While the department does not require that one method be used over another, the method must be thoroughly documented, and must take into consideration the expected distributions and life cycles of aquatic species

4.5.2 Habitat Assessment Methodology

Physical habitat assessment can be done during any biological sampling index period. There are a number of habitat measurement methodologies available, two of which are preferred by the department. One methodology is the department's *Project Procedure: Stream Habitat Assessment* (SHAPP), with supplementation of quantitative width, depth and sinuosity measurements (MDNR 2010b). The other possibility is the EPA Environmental Monitoring and Assessment Program's (EMAP) *Field Operations and Methods for Measuring the Ecological Condition of Wadeable Streams* (USEPA 1998), which is used by the Missouri Department of Conservation's Resource Assessment and Monitoring Program. These procedures are detailed in the sections below.

4.5.2.1 MDNR Stream Habitat Assessment Project Procedure

The department's established habitat assessment protocol is available through the department's UAA web site <http://www.dnr.mo.gov/env/wpp/wqstandards/uaa/index.html>. A limiting feature of the habitat assessment protocol is that it requires comparison to reference conditions and is not intended for comparisons made between different field personnel. A network of reference reaches for smaller, headwater streams has not yet been established for Missouri, but a reference condition cooperative project is currently under way at the time of this writing. A future Habitat Assessment Index will be developed based on quantitative data collected from study reference streams. For any UAA water body lacking an established reference reach, reference conditions may need to be quantified and documented as part of the UAA process

In order to make the strongest case possible for supporting removal or revision of a designated use, it will be helpful to collect supplemental quantitative habitat data for physical habitat evaluation. Supplementary quantitative stream channel measurements (see Sections 4.5.2.2 through 4.5.2.4 below) shall be collected and recorded. It is recommended that such data be submitted on the Channel Dimension Datasheet (Appendix 3-B)

4.5.2.2 Measurement of Sinuosity

Sinuosity is represented as a ratio of the actual channel length of stream between two points divided by the straight-line distance between the same two points on the stream. Using the Missouri Use Designation Dataset, aerial photos, site visits and other information as needed and supported by the department, measure the sinuosity and locate two points on the stream that would center the sampling reach. The target length of stream reach to be measured is 3200 meters. Actual distance between the two points on the stream can be between 3000 and 3400 meters. The habitat assessment reach should be centered in the sinuosity reach.

4.5.2.3 Measurement of Channel Characteristics

Measurement of channel characteristics should use the same stream section and transects as used for the MDNR SHAPP (MDNR 2010b). In addition to the ten habitat assessment transects; add one transect at the beginning of the stream section for a total of eleven cross-section measurements. Cross section measurements include the width between the bottoms of the lower banks – also known as the wetted width – and water depth at ten equally spaced points across this wetted width transect.

The following steps should be followed when measuring depth at each survey site:

1. Determine the average width of the stream segment by randomly selecting 5 points in the segment and taking channel width measurements across the tops of the lower banks.
2. The length of the survey segment should be 20 times the average width of the stream determined in Step a. The entire survey segment should be walked and 11 equidistant cross-sections measured along the length of the segment. Transects should be spaced the distance equal to 2 average stream widths.

3. The spacing of depth measurements along a cross-section should ensure there are ten equally spaced measurements between the left and right banks.
4. Report all measurements in meters.

4.5.2.4 Channel Metrics

The following metrics will be calculated from the cross-section measurements:

1. Lower Bank Channel Width (top of lower bank)
2. Wetted Width
3. Maximum Depth
4. Minimum Depth
5. Average Depth
6. Wetted Width-Average Depth Ratio. At each transect measure the width of the wetted channel in meters and the average depth in meters. Divide the wetted width by the depth to obtain the ratio. The average depth should be calculated by a minimum of three equally spaced depth measurements across the width of the stream. The distance between depth measurements should be no greater than 0.9 meters.
7. Wetted Width to Lower Bank Channel Width Ratio. Divide the wetted width by the lower bank channel width. Channel width is the distance between the bottom of the upper stream bank on opposite sides of the stream channel.
8. Depth variability (heterogeneity of conditions expressed as the standard deviation)
9. Wetted width variability (heterogeneity of conditions expressed as the standard deviation)

4.5.2.5 EMAP Physical Habitat Procedure

Extensive stream habitat measurements can also be collected using the Environmental Monitoring and Assessment Program's (EMAP) *Field Operations and Methods for Measuring the Ecological Condition of Wadeable Streams*. These procedures are intended for evaluating physical habitat in wadeable streams, and are designed for monitoring applications where robust, quantitative descriptions of the habitat at the reach scale are desired. The EMAP field procedures are most efficiently applied during base flow conditions and times when terrestrial vegetation is active, but may be applied during other seasons and higher flows, except as limited by safety considerations. Currently the procedure does not have assessment criteria and is analyzed by a SAS program where 400+ metrics are calculated. This makes the current use of the EMAP Physical Habitat Procedure most applicable to comparative studies and trend analyses. The EMAP physical habitat procedure is available through EPA's EMAP web site at http://www.epa.gov/emap2/html/pubs/docs/groupdocs/surfwatr/field/ws_chap.html.

4.5.3 Water Chemistry Evaluation

Water chemistry samples should be collected and analyzed for parameters that are indicative of the UAA factor(s) being evaluated. Applicable Quality Assurance Project Plans and Standard Operating Procedures will be followed.

4.5.4 GIS Evaluation

GIS evaluations may be used to determine how spatial and landscape characteristics relate to the hydrologic and aquatic conditions. GIS data should not be used as a stand-alone factor in determining aquatic habitat use attainability; rather it may be used to support biological and physical habitat field measurements. Any GIS data used must have applicable metadata.

4.5.5 Sub-segmentation

A water body may be a candidate for sub-segmentation if it can be demonstrated that the aquatic life use is not existing or attainable for a portion of the water body segment. Sub-segmentation may be appropriate where lakes or ponds are established in stream channels, modifying stream flow and resulting in more than one hydrologically distinct segment. Sub-segmentation may also be appropriate when a portion of the stream segment has been permanently filled in and developed, and where the stream channel no longer exists. Channelization, or other modification to the stream channel, is not in and of itself justification for sub-segmentation.

The party conducting the survey must clearly identify the start and end points (upstream and downstream coordinates, respectively) of the sub-segment and specifically discuss justification in the UAA report. The endpoints of the sub-segment shall be at a stream confluence as illustrated in the Missouri Use Designation Dataset.

Sub-segmentation should be addressed during the Pre-Assessment Meeting and in the UAA report. If it becomes evident that sub-segmentation may be appropriate after fieldwork begins, the Pre-Assessment Plan should be revisited and modified, if necessary, to meet the distribution of sites.

4.5.6 Maps

All sites should be clearly marked on a map at a scale appropriate to capture the stream segment as it appears in the Missouri Use Designation Dataset. The Universal Transverse Mercator (UTM), North American Datum 1983 (NAD83), Zone 15, coordinate system shall be used and recorded for each site with all appropriate fields completed on Data Sheets A and B.

Geographic coordinates identifying the location of each site may be collected using a Global Positioning System (GPS) receiver or smartphone. While GPS coordinates are the preferred method of establishing site locations, mapping-related web sites like that available at the department's Geographic Information Systems web page (<http://www.dnr.mo.gov/gis/index.html>) may also be used.

Maps submitted as part of the UAA should clearly identify the subject water body, including location and extent, and include all standard map features (north arrow, scale bar, etc.). The map should also include any additional information necessary to determine use attainability and to allow for complete and accurate review by the department. Such information may include, but is not limited to:

1. Locations referenced in interviews (clearly identify interviewee and activity)
2. Permitted facilities
3. Cities, towns, counties
4. Major and minor roads
5. Public areas (e.g., parks; conservation areas; national or state forests, etc.)
6. Local landmarks (e.g., churches, cemeteries, airfields, etc.)
7. Aerial imagery
8. Land use/land cover

4.5.7 Datasheets

The following datasheets are available at:

<http://www.dnr.mo.gov/env/wpp/wqstandards/uaa/index.html>

Appendix 3-A. Water Body Identification Form

Appendix 3-B. Channel Dimensions Datasheet

Appendix 3-C. Biological Data (electronic format only)

4.5.8 Photographic Record

A digital photographic record should be made of all assessed sites. Photographs should be taken from the same point in the stream each time the station is sampled. When possible, successive photographs should be taken during similar light conditions and if possible, be taken at the same time of the day, or month in which the previous photographs were taken. The photographs should include an upstream view, downstream view and any photographs required to document human activity in and directly along the stream channel and its alignment. Photographs should be marked or catalogued in a manner that indicates the site location and sampling date and what is being shown by each photograph.

4.5.9 Interviews

Interviews of past and present conditions of a water body can be useful in determining the nature and extent of impacts that may affect the attainability of an aquatic life use. Interviews should contain detailed locations and descriptions so that department staff can determine the applicability of the interview toward the proposed revision or removal of aquatic habitat use.

Interviews from users present during the field survey, streamside landowners and local residents are encouraged in order to obtain information on existing and historical uses of the water body in question.

4.6 UAA Report Submission

Any interested party may conduct an Aquatic Habitat UAA and submit the report to the department for review. Two copies of the completed UAA report and all supporting documentation should be sent to:

UAA Internal Review Committee
Watershed Protection Section
Water Protection Program
Missouri Department of Natural Resources
P.O. Box 176
Jefferson City, MO 65102-0176

In order to ensure a complete UAA is submitted to the department, the instructions and guidance provided in this document should be followed and the UAA report must contain the following:

1. statement of the issue,
2. presentation and evaluation of all evidence (including data),
3. maps of the water body segment
4. all completed data sheets,
5. all photographs,
6. any interviews that were conducted.

A diagram of the Use Attainability Analysis evaluation process that should be considered when drafting the UAA report can be found in Appendix 1 of this document. The department will return incomplete UAAs or request that missing elements be submitted before proceeding with the UAA review.

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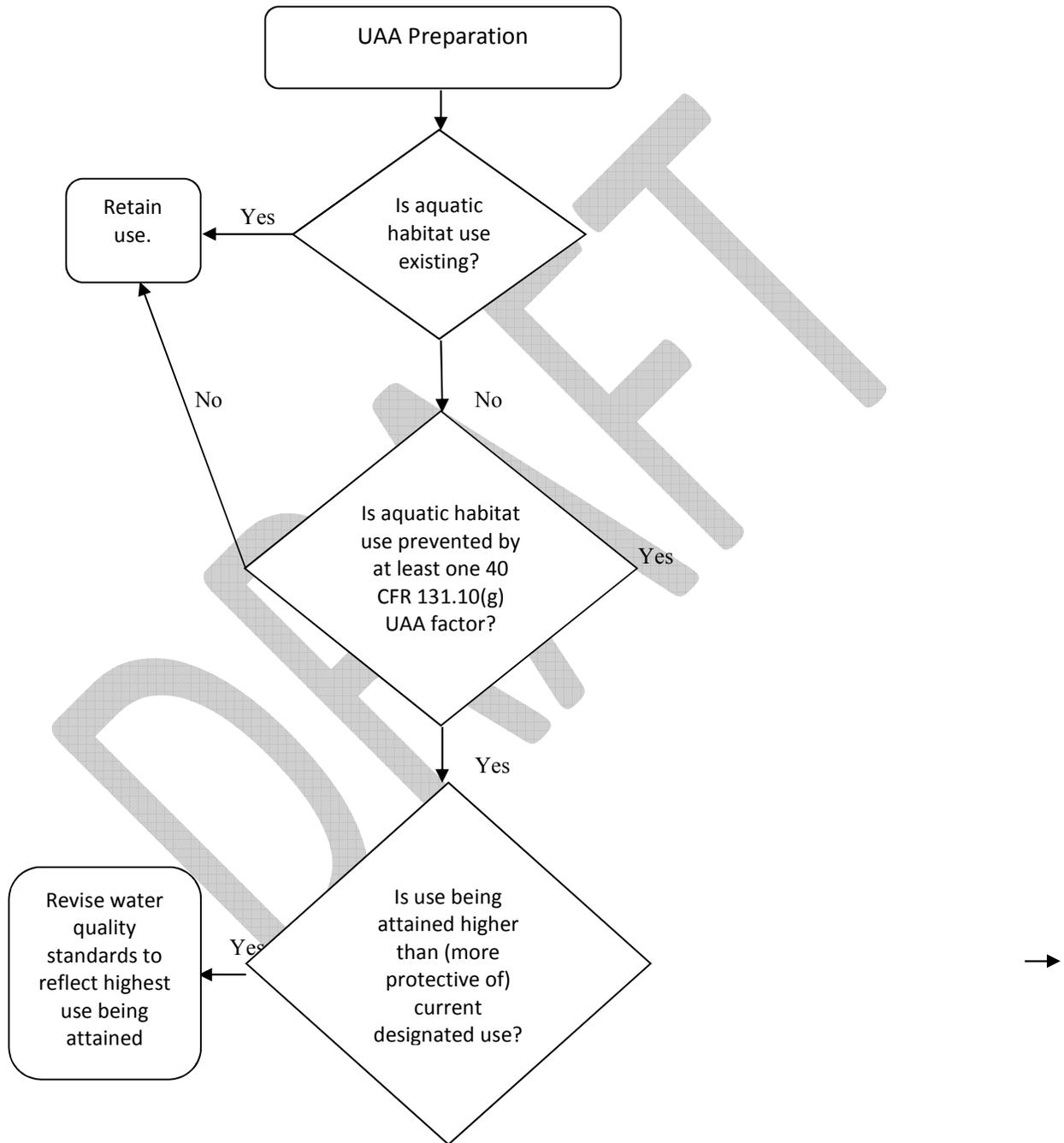
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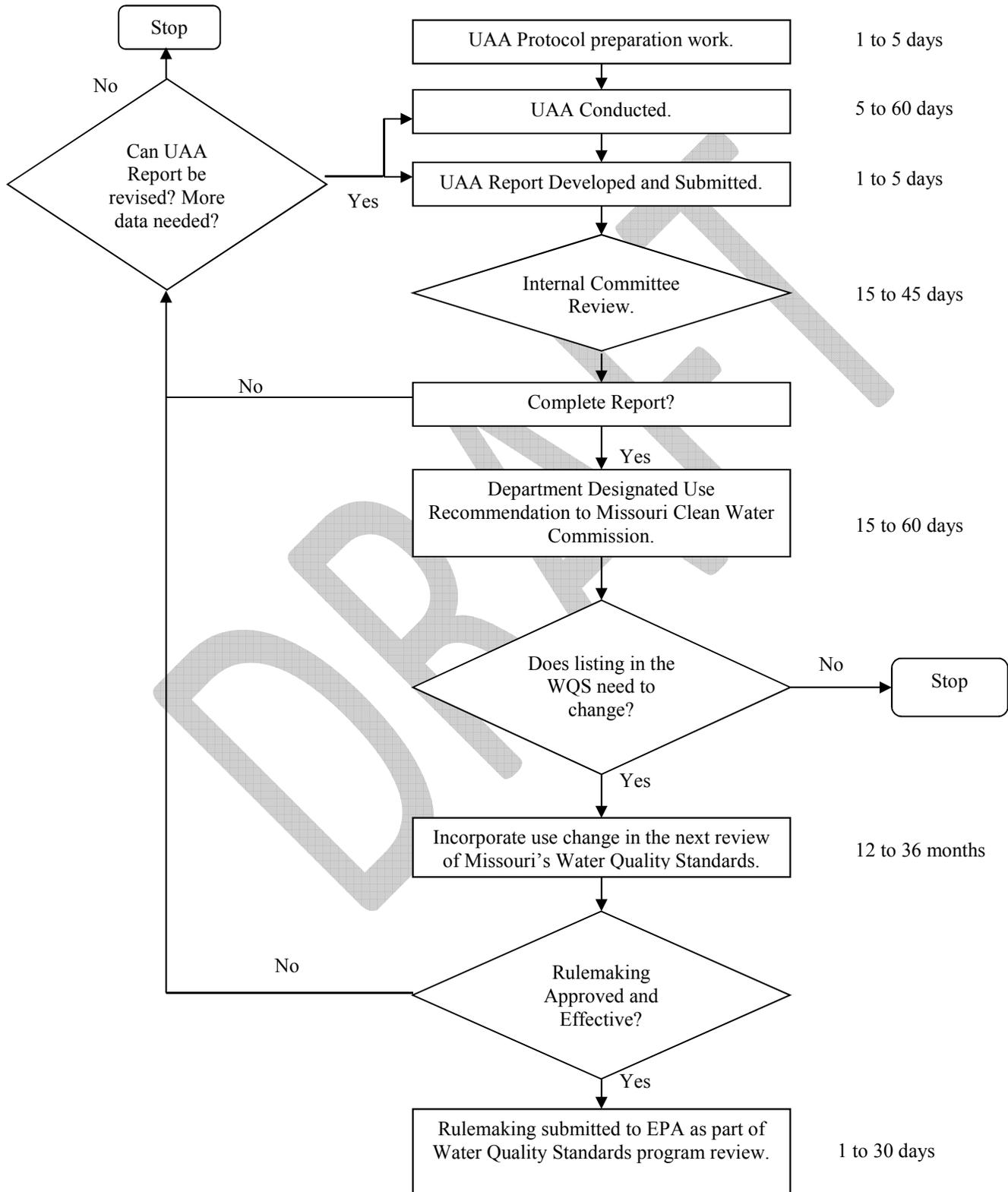
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Appendix 1 Aquatic Habitat Use Attainability Analysis Evaluation Process



Appendix 2 Aquatic Habitat Use Attainability Regulatory Process



Appendix 3 Use Attainability Analysis Field Data Sheets

Data Sheet A – Water Body Identification

I. Water Body Information (for water body being surveyed)

Water Body Name (if applicable):
Missouri Water Body Identification (WBID) Number:
Segment I.D. (from Use Designation Dataset):
8-digit HUC:
County(ies), Listed Downstream to Upstream:
Downstream UTM (Easting/Northing):
Upstream UTM (Easting/Northing):
Number of sites evaluated:
List all site numbers, <u>consecutively downstream to upstream</u> :
Include a Site Location Map(s). The map must include all requirements detailed in the <i>Missouri Aquatic Habitat Use Attainability Analyses: Water Body Survey and Assessment Protocol</i> (Section 4.4.12.1).

II. Facility Information (list all permitted discharges to this water body segment)

Facility Name(s) and Permit Number(s):
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III. UAA Surveyor (please PRINT legibly)

Name of Surveyor:	Telephone Number:
Organization/Employer:	

Please be sure that all sections of this and other applicable data sheets have been completed.

Signed: _____ Date: _____

Data Sheet B - Aquatic Life Use Attainability Assessment - Channel Dimension Datasheet

Stream Name:				Waterbody ID:				Site #:				Date:							
Field Team Members:																Time:			
GPS Location		Easting		Northing		Horizontal Accuracy Estimate (EPE / PDOP / FOM)						Dissolved Oxygen: (mg/L)							
Transect 01		UTM X:		UTM Y:		+/-:(m)						Dissolved Oxygen: (% saturation)							
Transect 11		UTM X:		UTM Y:		+/-:(m)						Specific Conductivity: (um/cm)							
Average Stream Width (m): (from top of lower bank - to determine Length of Survey Segment)																Water Temperature: (°C)			
Length of Survey Segment (m): (20x average stream width)																Rainfall: (inches) Previous 15 days			
Estimated Channel Incision (m): (height between top of lower bank and water)																Sinuosity:			

Transect Cross-Section Measurements

Transect	01		02		03		04		05		06		07		08		09		10		11	
Channel Width																						
	Distance (m)	Depth (m)																				
Left Wetted Edge	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Depth 1																						
Depth 2																						
Depth 3																						
Depth 4																						
Depth 5																						
Depth 6																						
Depth 7																						
Depth 8																						
Depth 9																						
Right Wetted Edge		0		0		0		0		0		0		0		0		0		0		0
Feature Type (riffle, run, or pool)																						

Notes: Transects will be measured beginning on left descending bank water edge and finish on right descending bank water edge. This right wetted edge distance is the wetted width.
 GPS locations corresponds to Transect 01 and 11. Transects ordered in upstream to downstream order.
 Depth measurements taken at 9 equally spaced locations along transect (determine by dividing wetted width by 10)
 Mark dry depth measurements as 0; record actual measurements to 0.01 meter unless depth is too deep to measure (then record as greater than [>] the maximum depth the crew is able to record)
 Sinuosity of the stream reach; represented as a ratio of the actual channel length of stream between two points divided by the straight-line distance between the same two points on the stream.

Surveyor's Signature:	Date:
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