



# Oregon Fish Passage Barrier Data Standard

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## 1.0 Introduction

Under the direction of the Oregon Geographic Information Council (OGIC), the Oregon Bioscience Framework Implementation Team (Bio-FIT) has delegated the development of a prototype Fish Passage Barrier Data Content Standard to its Fish Passage Barriers Workgroup. The Bioscience Theme currently includes 15 elements. Fish Passage Barriers is one of those elements.

The Oregon Fish Passage Barrier Data Standard (OFPBDS) specifies a common model for representing geospatial fish passage barrier information. The scope of the standard includes both existing and potential fish passage barriers. The model is intended to facilitate integration and sharing of fish passage barrier data. The OFPBDS will also serve to improve the accuracy and completeness of fish passage barrier data, thus improving their value and usefulness for supporting resource planning.

The OFPBDS is the result of multiple workgroup meetings that occurred between December 2006 and May 2007 and specifies fundamental geospatial information needed by numerous entities that are working to inventory and/or resolve fish passage issues.

### 1.1 Mission and Goals of Standard

The OFPBDS will provide a consistent and maintainable structure for both producers and users of fish passage barrier data. The OFPBDS will help to ensure the compatibility of datasets within the Bioscience framework feature set and also between other framework feature sets and themes. Agencies that are responsible for the creation, maintenance and distribution of fish passage barrier data can use the standard to reduce the costs of data sharing, development and maintenance. It will also help to ensure that fish passage barrier data attributes (including geometry) are kept as up-to-date as possible through the broad involvement of those entities with local expertise. Fish passage barrier data will be more easily disseminated to and consumed by both resource agencies and the public once the OFPBDS is in place.

The goal of the OFPBDS is to ensure that fish passage barrier data applications are able to acquire data from disparate sources and use the results in an appropriate manner for the required need. Additionally, the standard will facilitate data maintenance at a “local” or originator level which will assure that the most current dataset is available to support resource-planning decisions.

### 1.2 Relationship to Existing Standards

There are no widely accepted standards in place that directly address geospatial fish passage barrier data. The StreamNet Data Exchange Format is one existing standard, but its use outside of the StreamNet Project participants is limited. All geospatial datasets developed under the OFPBDS must adhere to the recently adopted *Oregon Metadata Standard* once the implementation plan for that standard is published.

### 1.3 Description of Standard

The OFPBDS includes the essential elements and data structure necessary to adequately describe, develop, exchange and use fish passage barrier data produced in Oregon. The OFPBDS focuses on a core set of geospatial information, including geometry, to support the need for an accurate, current and complete representation of the fish passage barriers affecting fish migration throughout the state. Applications to be supported initially include the inventory and prioritization of fish passage barriers (for correcting passage issues) by user-specified parameters at multiple scales. The standard provides a basic characterization of current and potential barriers and also the general passage status at each feature. Detailed passage assessment data (e.g., measurements of stream hydraulics) are not included in the standard at this time.

### 1.4 Applicability and Intended Use of Standard

The OFPBDS is applicable to the feature sets that represent potential impediments to fish passage within the waters of the state including, but not limited to, dams, culverts, bridges, tide gates, weirs, falls, cascades and gradient barriers.

This standard is intended to support the automation, integration and sharing of publicly available fish passage barrier information. By ensuring the unique identification of each fish passage barrier within the state, the standard will enhance the prospects of developing a comprehensive dataset representing these features. It will also guide accurate documentation of fish passage barrier information produced for and in Oregon. It will be available for use by all levels of government, industry, watershed councils and the general public to achieve both a consistent graphic representation and a basic set of common attributes.

This standard does not preclude agencies from developing and maintaining fish passage barrier data differently for internal purposes. However, shared versions of the datasets must meet the requirements set forth in this standard.

### 1.5 Standard Development Procedures

The Bio-FIT Workgroup on Fish Passage Barriers is comprised of representatives from federal, state, tribal, regional, and county governmental agencies. It is an outgrowth of a Fish Passage Barrier Data Summit that ODFW hosted in September 2006. A record of the workgroup meetings and standards-related documents are posted to the Oregon Geospatial Enterprise Office site at: [http://gis.oregon.gov/DAS/EISPD/GEO/fit/bioscience/fish\\_passage\\_barriers.shtml](http://gis.oregon.gov/DAS/EISPD/GEO/fit/bioscience/fish_passage_barriers.shtml). This team created the first draft of a standard fish passage barrier data structure in May 2007 and published the draft standard via email lists, open meetings and through the Oregon Geospatial Enterprise Office website at: <http://gis.oregon.gov/DAS/EISPD/GEO/standards/standards.shtml>.

The viability of the OFPBDS was tested in May 2007.

## **1.6 Maintenance of Standard**

The Oregon Fish Passage Barrier Data Standard will be revised on an as-needed basis. Revisions can be initiated by members of the standards workgroup or by anyone in the GIS or natural resource community with significant revisions, needs or expertise related to the creation, maintenance or integration of fish passage barrier geospatial data. As fish passage barrier data and related geospatial applications mature, this standard will likely need to be updated. The minimum attributes in the existing standard could be expanded to include more passage assessment details, and requirements for locational accuracy may also be revisited. Also, as the Framework Hydrography Standard evolves in the direction of the National Hydrography Dataset, there may be necessary updates to the linear referencing components of the OFPBDS. The Oregon Department of Fish and Wildlife will assume responsibility for maintaining the standard and the fish passage barrier data for the state as Horizontal Steward. Work will be dependent on available funding and other partners may assist with these responsibilities.

## **2.0 Body of the Standard**

### **2.1 Scope and Content of the Standard**

The scope of the OFPBDS is for any natural or artificial structure that fully crosses “waters of the state” and has the potential to block upstream or downstream fish passage, either now or in the future (e.g., dams, culverts, bridges, tide gates, weirs, falls, cascades and gradient barriers). It includes publicly available vector data accompanied by required metadata. The scope of the OFPBDS does not include large woody debris placed for stream restoration purposes nor does it include dikes, levees, burms or water quality / quantity-related barriers that are not associated with in-stream features.

The unique identification of fish passage barriers and barrier “sites” is also within the scope of this standard (as identified and discussed in the data structure in Appendix B). The content is focused on the essential data and metadata elements required for datasets that are maintained and contributed by local, regional or statewide agencies or organizations.

### **2.2 Need for the Standard**

Multiple state and federal natural resource agencies, as well as watershed councils, tribes, counties, Soil and Water Conservation Districts and other entities, currently collect fish passage barrier information. Within the context of a watershed, fish passage barrier information has limited value for understanding impacts on fish populations unless it is relatively complete. While there are some examples of relatively complete fish passage barrier inventories that cover entire watersheds, most inventories are focused on a particular barrier type (e.g., culvert) or a specific jurisdiction within or across a watershed. Those entities that require a more complete understanding of the fish passage barriers within a particular watershed will now have a template for developing a comprehensive inventory. Where complete inventories do exist, they are typically not consistent across watersheds. The prioritization of fish passage barrier removal at a statewide level (across watersheds) would benefit tremendously from this standard, as it will ultimately make this task more feasible.

The implementation of this standard will also help to develop a clearer understanding of the habitat gains made through the removal of fish passage barriers.

The unique identification of fish passage barriers will also help prevent potentially duplicative efforts by agencies or organizations to collect and maintain information on the same barriers.

## **2.3 Participation in Standards Development**

The efforts to develop standards for fish passage barrier-related geospatial data are still in their early stages. Numerous individual fish passage inventories and associated data structures have been developed. In some cases data structures have been shared between disparate inventory efforts, but for the most part, no broad standards are in place for fish passage barriers.

The OFPBDS and the process by which it will be updated / enhanced is open to all agencies concerned with the development, maintenance, and application of fish passage barrier data to the resolution of fish habitat-related management issues. As with all Oregon Framework standards, public review of and comments on the OFPBDS is encouraged. An outline of Oregon's process for the development and extension of geospatial data standards is posted at:

([http://gis.oregon.gov/DAS/EISPD/GEO/standards/docs/Standards\\_Development\\_Effort.pdf](http://gis.oregon.gov/DAS/EISPD/GEO/standards/docs/Standards_Development_Effort.pdf)).

Participation in the Fish Passage Barriers Bio-FIT workgroup spans the spectrum of governmental agencies in Oregon. Currently, the workgroup is led by the Oregon Department of Fish and Wildlife, with important time and resource commitments from the Oregon Department of Forestry, Oregon Water Resources Department, Oregon Department of Transportation, Oregon Watershed Enhancement Board, Washington Dept. of Fish and Wildlife, Oregon State University Institute for Natural Resources, Metro, Washington County, Benton County Soil and Water Conservation District, Columbia River Intertribal Fish Commission, the US Bureau of Land Management, the US Forest Service, Pacific States Marine Fisheries Commission, US Bureau of Reclamation and NOAA Fisheries. We have also had participation by the Association of Oregon Counties, Oregon Department of State Lands, the Siletz tribe, US Fish and Wildlife Service and the Clackamas Basin Watershed Council.

## **2.4 Integration with Other Standards**

The OFPBDS follows the same format as other Oregon Framework geospatial data standards. The specifics of the OFPBDS are related to the Hydrography and Road Centerline standards, mainly in relation to the position of road / stream crossings (bridges and culverts).

## **2.5 Technical and Operation Context**

### *2.5.1 Data Environment*

The data environment for the OFPBDS is a vector model comprised of points. The model tracks the logical relationships between the coordinate points, including features that are represented as lines or polygons. The exchange medium for fish passage data files is the Environmental Systems Research Institute (ESRI) shapefile, which is a public domain data structure relating points, lines, polygons and feature attribution (including shape geometry). This exchange medium is supported by all known GIS software suites in use in Oregon. Information about the technical specification for the ESRI shapefile is

found at: <http://www.esri.com/library/whitepapers/pdfs/shapefile.pdf>. In designating the shapefile as the exchange format, this standard has been designed to accommodate its limitations, such as limiting attribute (field) names to ten characters. In a future version of this standard, we will investigate other formats for data exchange which are able to preserve a more flexible data model.

### 2.5.2 *Reference Systems*

The coordinate reference systems typically used in Oregon are the Universal Transverse Mercator (zone 10, which comprises all land in Oregon to the west of 120 degrees west longitude, and zone 11, which comprises all land to the east of 120 degrees west longitude), the Lambert Conformal Conic (the Oregon State Plane system, divided into State Plane North and State Plane South along the county boundaries near 44 degrees north latitude, and Oregon Lambert described at:

<http://gis.oregon.gov/DAS/EISPD/GEO/data/format.shtml>).

### 2.5.3 *Integration of Themes*

The OFPBDS relates to the Framework Hydrography and Road Centerline standards. All fish passage barrier data that meet the OFPBDS are located on stream features that are found in the PNW Hydrography Framework watercourse dataset. Numerous aquatic features are spatially referenced to the Hydrography standard streams template. Understanding the spatial relationships between fish passage barriers and other aquatic features (e.g., fish distribution) would be greatly enhanced by including the optional stream attribute information. The stream-related attribute information will be optional initially in order to encourage compliance, but as this information is attributed more commonly it may become required in future versions of the OFPBDS.

In the cases of culverts and bridges, fish passage barriers are also commonly associated with road features and consequently the Road Centerline data standard. Similar to the optional Hydrography attributes, there are also optional road location attributes within the OFPBDS which will facilitate understanding the relationship between the two feature sets.

### 2.5.4 *Encoding*

Encoding translates user formats into standard formats, like the shapefile specified here for exchange. All GIS software used in Oregon has the capability of encoding its format to the shapefile format.

### 2.5.5 *Resolution*

The OFPBDS dataset resolution will vary according to local data capture methods and the business applications that those data must support. It is the intention of the OFPBDS to allow for the integration of data collected at multiple spatial resolutions. Resolution will be tracked as a metadata element, and it is intended to reflect the best available attribution related to fish passage barrier data (including geometry). A recommended minimum scale of 1:24,000 has been designated to provide a target scale for potential data originators to use when initiating new fish passage barrier data development efforts.

### 2.5.6 *Accuracy*

As with resolution, the intention of the OFPBDS is to support varying levels of positional and attribute accuracy. However, it is essential to the success of the data standard that all aspects of fish passage barrier data be completely documented (either at the feature or dataset level).

### 2.5.7 *Edge Matching*

The OFPBDS is intended to facilitate the compilation of a comprehensive dataset for Oregon fish passage barriers. Similar datasets from adjacent states using the same projection and horizontal/vertical datum should merge with the OFPBDS data to cover a multi-state area. Edge matching between jurisdictional submissions will be implemented by the Horizontal Steward according to established business rules. Where multiple data originators submit data on the same passage feature, the Horizontal Steward will refer these back to the originators for reconciliation.

### 2.5.8 *Feature Identifier*

The feature identifier will be created and maintained by the Horizontal Steward for this element. The feature identifier will uniquely identify fish passage barrier features and related attributes for the OFPBDS. A unique identifier for fish passage barrier “sites” (e.g., collection of multiple culverts at a single road-stream crossing) will also be created and maintained by the Horizontal Steward. Each fish passage barrier record will have both a feature ID and a site ID.

### 2.5.9 *Features and Attributes*

There are three feature types, points, lines and polygons, and their associated characteristics.

#### 2.5.9.1 *Points*

Points are geospatial objects that represent site-specific fish passage barrier data features. The point may represent the center of the feature or another, more specific location at the feature (e.g., culvert outlet). Points can be uniquely identified using the feature identifier described in Section 2.5.8. These are the primary features to which fish passage barrier characteristics will be attributed.

#### 2.5.9.2 *Lines*

Lines are geospatial objects that represent fish passage barrier features that extend throughout a length of stream (e.g., long culverts, gradient barriers). Lines can be uniquely identified using the feature identifier described in Section 2.5.8.

#### 2.5.9.3 *Polygons*

Polygons are geospatial objects that represent fish passage barrier features that have a significant areal extent (e.g., medium or large-sized dams). Polygons can be uniquely identified using the feature identifier described in Section 2.5.8.

#### 2.5.9.4 *Associated Characteristics*

Associated characteristics are any of the additional information that is collected and shared in relation to the representation of a fish passage barrier. These are referred to as attributes in spatial datasets. See Section 3 for the specification of minimal and optional characteristics for fish passage barrier points, lines and polygons.

### 2.5.10 *Transactional Updating*

Transactional updating processes will be explored as a functional component of the Oregon Fish Passage Barrier Database. This database will be developed (funding contingent) once the OFPBDS is endorsed, and it will be hosted at the Oregon Department of Fish and Wildlife. Through a combination of local (originator) feature identification codes and statewide, unique feature identification codes, it should be

possible to manage the regular merging of locally managed fish passage barrier data into a statewide data structure.

### *2.5.11 Records Management*

Past versions of the Oregon fish passage barrier dataset will be maintained and available for retrieval through the relational database management system hosted by the Horizontal Steward. This functionality is essential to the business applications that ODFW requires this database to support. The time period needed for archival copies of the database is undetermined at this time, but archiving is mandated under Oregon Rules and Statutes and through Oregon Administrative Rules. At the minimum, those mandates will be satisfied. Archived datasets may be made available through the Oregon State University Institute for Natural Resources.

### *2.5.12 Metadata*

The OFPBDS follows the Oregon Core Metadata Standard for geospatial data. Metadata detailing the characteristics and quality of submitted fish passage barrier data must be provided. Metadata should make every effort to meet the more rigorous standards set forth in the Federal Geographic Data Committee Metadata Content Standard, where feasible. Metadata must provide sufficient information to allow the user to determine if that dataset will meet the intended purpose, as well as telling the user how to access the data.

## **3.0 Data Characteristics**

The data characteristics specified below are subject to revision based on the documented efforts of the Bio-FIT Workgroup on Fish Passage Barriers to test the feasibility and usability of the OFPBDS.

### **3.1 Minimum Graphic Data Elements**

#### *3.1.1 Points*

<i>ITEM NAME</i>	<i>TYPE</i>	<i>WIDTH</i>	<i>DESCRIPTION</i>
Shape	Geometry		Fish passage barrier feature point (generated internally by GIS software)
fpbFtrID	Long integer	9	Framework unique identifier for the fish passage barrier feature (generated by the Horizontal Steward)
fpbLong	Float	8.4	“Longitudinal” planar component of point location on earth’s surface, in geographic decimal degrees (datum documented in metadata)
fpbLat	Float	6.4	“Latitudinal” planar component of point location on earth’s surface, in geographic decimal degrees (datum documented in metadata)
fpbSiteID	Long integer	9	Framework unique identifier for the fish passage barrier site (generated by the Horizontal Steward)

### 3.2 Minimum Attribute or Non-graphic Data Elements

#### 3.2.1 Points

<i>ITEM NAME</i>	<i>TYPE</i>	<i>WIDTH</i>	<i>DESCRIPTION</i>
fpbRevDate	Text	8	Date of data entry into or revision in the Framework dataset (YYYYMMDD)
fpbOFtrID	Text	40	Unique ID for each fish passage barrier feature at a site, generated by the data originator
fpbONm	Text	30	Name of the source originator / entity that provides the data
fpbOSiteID	Text	40	Unique ID for each fish passage barrier site, generated by the data originator
fpbLocMd	Text	15	Method used to collect or generate location information
fpbLocAccu	Short integer	4	Accuracy of fish passage barrier feature location (+ or – feet)
fpbLocDt	Text	8	Most recent date of location data collection (YYYYMMDD)
fpbFtrTy	Text	25	Fish passage barrier feature type
fpbFtrNm	Text	50	Fish passage barrier feature name
fpbRmvDt	Text	8	Date that fish passage barrier feature was removed (required only if removed - YYYYMMDD)
fpbMltFtr	Text	7	Flag for multiple fish passage barrier features at the site (yes / no / unknown)
fpbFPasSta	Text	8	Status of fish passage at the barrier feature
fpbStaEvDt	Text	8	Date passage status was last evaluated (YYYYMMDD)
fpbStaEvMd	Text	20	Passage status evaluation method
fpbFySta	Text	10	Fishway status

### 3.3 Optional Graphic Data Elements

#### 3.3.1 Lines

<i>ITEM NAME</i>	<i>TYPE</i>	<i>WIDTH</i>	<i>DESCRIPTION</i>
Shape	Geometry		Ordered string of coordinate pairs representing linear passage feature shape/geometry (generated internally by GIS software)
fpbFtrID	Long integer	9	Framework unique identifier for the fish passage barrier feature (generated by the Horizontal Steward)
fpbSiteID	Long integer	9	Framework unique identifier for the fish passage barrier site (generated by the Horizontal Steward)

#### 3.3.2 Polygons

<i>ITEM NAME</i>	<i>TYPE</i>	<i>WIDTH</i>	<i>DESCRIPTION</i>
Shape	Geometry		Geographic area feature (generated internally)
fpbFtrID	Long integer	9	Framework unique identifier for the fish passage barrier feature (generated by the Horizontal Steward)
fpbSiteID	Long integer	9	Framework unique identifier for the fish passage barrier site (generated by Horizontal Steward)

### 3.4 Optional Attribute or Non-graphic Data Elements

#### 3.4.1 Points

<i>ITEM NAME</i>	<i>TYPE</i>	<i>WIDTH</i>	<i>DESCRIPTION</i>
fpbCrdDesc	Text	254	Identifies exact location to which coordinates refer
fpbStrID	Text	13	Stream route identifier (Framework Hydrography)
fpbStrMeas	Float	7.3	Stream route measure (kilometers to 3 decimal places)
fpbStrNm	Text	50	Stream name from GNIS
fpbRdID	Text	13	Road route identifier (Framework – OR Road Centerline)
fpbRdMeas	Float	7.3	Road route measure (kilometers to 3 decimal places)
fpbRdNm	Text	50	Road name from GNIS
fpbLocONm	Text	30	Name of location data provider entity (if different from identification data originator). See data dictionary for associated elements.
fpbFtrSTy	Text	30	Fish passage barrier feature subtype
fpbFtrNmSr	Text	5	Fish passage barrier feature name source
fpbHeight	Float	4.1	Fish passage barrier feature height (feet)
fpbLength	Float	5.1	Fish passage barrier feature length (feet)
fpbWidth	Float	5.1	Fish passage barrier feature width (feet)
fpbSlope	Float	3.1	Slope of fish passage barrier feature (percent, 1 decimal)
fpbDrop	Float	3.1	Distance from culvert outlet to the water surface of the pool below (feet, 1 decimal)
fpbOrYr	Text	4	The year the fish passage barrier feature was built or installed (origin year). Natural barriers to be assigned year of statehood (1859) unless known to be otherwise
fpbModDt	Text	8	Fish passage barrier feature modification date (YYYYMMDD)
fpbDesONm	Text	30	Name of description data originator / entity (if different from identification data originator). See data dictionary for associated elements.
fpbOwn	Text	60	Owner of the fish passage barrier feature
fpbLOwn	Text	60	Owner of the land where the fish passage barrier feature is located
fpbOperate	Text	60	Operator of the fish passage barrier feature
fpbFyOwn	Text	60	Fishway owner
fpbOwnTy	Text	15	Fish passage barrier feature owner type
fpbLOwnTy	Text	15	Fish passage barrier feature landowner type
fpbOwnONm	Text	30	Name of ownership data originator / entity (if different from identification data originator). See data dictionary for associated elements.
fpbFyTy	Text	15	Fishway type
fpbFySTy	Text	20	Fishway subtype
fpbFyOrYr	Text	4	The year the fishway was built or installed (origin year)
fpbFPasONm	Text	30	Name of Fish Passage data originator / entity (if different from identification data originator). See data dictionary for associated elements.
fpbLocMdD	Text	100	Fish passage barrier feature location collection method – description for “other”
fpbFtrTyD	Text	100	Fish passage barrier feature type – description for “other”
fpbFtrSTyD	Text	100	Fish passage barrier feature subtype – description for “other”
fpbEvMdFAD	Text	100	Fish passage status evaluation method – description for “other full assessment”
fpbEvMdPAD	Text	100	Fish passage status evaluation method – description for “other partial assessment”
fpbFyTyD	Text	100	Fishway type – description for “other”
fpbLOwnTyD	Text	100	Fish passage barrier feature landowner type – description for “other”

### 3.4.2 Lines

Same as optional attributes for points except that the element `fpbStrMeas` would be replaced with the following two elements:

<i>ITEM NAME</i>	<i>TYPE</i>	<i>WIDTH</i>	<i>DESCRIPTION</i>
<code>fpbStrBMeas</code>	Number	8.3	Stream route begin measure (kilometers to 3 decimal places)
<code>fpbStrEMeas</code>	Number	8.3	Stream route end measure (kilometers to 3 decimal places)

### 3.4.3 Polygons

Same as optional attributes for points except that the element `fpbStrMeas` would be replaced with two stream measure elements and the element `fpbRdMeas` would be replaced with two road measure elements:

<i>ITEM NAME</i>	<i>TYPE</i>	<i>WIDTH</i>	<i>DESCRIPTION</i>
<code>fpbStrBMeas</code>	Number	8.3	Stream route begin measure (kilometers to 3 decimal places)
<code>fpbStrEMeas</code>	Number	8.3	Stream route end measure (kilometers to 3 decimal places)
<code>fpbRdBMeas</code>	Number	8.3	Road route begin measure (kilometers to 3 decimal places)
<code>fpbRdEMeas</code>	Number	8.3	Road route end measure (kilometers to 3 decimal places)

## Appendix A: Definitions of Terms

(Extracted from Parts 0 and 5 of the Geographic Information Framework Data Content Standard, state of Oregon fish passage-related OAR language and workgroup deliberations)

<b><u>Term</u></b>	<b><u>Definition</u></b>
<b>Accuracy</b>	<b>Absolute</b> - A measure of the location of features on a map compared to their true position on the face of the earth. <b>Relative</b> - A measure of the accuracy of individual features on a map when compared to other features on the same map.
<b>Areal</b>	Two-dimensional.
<b>Attribute</b>	Attributes are the characteristics of <b>features</b> .
<b>Bed/Bed and Banks</b>	The physical container of the waters of this state, bounded on freshwater bodies by the ordinary high water line or bankfull stage, and on bays and estuaries by the limits of the highest measured tide.
<b>Boundary</b>	Set that represents the limit of a <b>feature</b> .
<b>Channel</b>	A waterway that periodically or continuously contains moving waters of this state and has a definite bed and banks that serve to confine the water.
<b>Debris Jam</b>	A naturally deposited accumulation of logs or other debris which impedes fish passage and is projected to persist for three years or more under ordinary flow conditions.
<b>Feature</b>	Abstraction (point, line or polygon) of a real world phenomenon stored within geospatial software.
<b>Feature Delineation</b>	Criteria or rules for defining the limits of a <b>feature</b> and how it will be represented geometrically in a dataset.
<b>FGDC</b>	Federal Geographic Data Committee.
<b>Fish</b>	Species of the vertebrate taxonomic groups of Osteichthyes (bony fishes) and Cephalaspidomorphi (lamprey).
<b>Fishway</b>	The set of human-built and/or operated facilities, structures, devices, and measures that together constitute, are critical to the success of, and were created for the sole purpose of providing upstream fish passage at artificial or natural obstructions which create a discontinuity between upstream and downstream water or bed surface elevations.
<b>Fish Passage Barrier</b>	Any natural or artificial structure that fully crosses “waters of the state” and has the potential to block upstream or downstream fish passage, either now or in the future (e.g., road crossings, dams, tide gates, falls, cascades). As noted in the scope, it does not include large woody debris placed for stream restoration purposes nor does it include dikes, levees, burms or water quality / quantity-related barriers that are not associated with in-stream features.

<b>Fish Passage Barrier Feature</b>	A single (actual / potential) fish passage barrier structure. For the purposes of this standard, fishways will be managed in <i>association</i> with passage features and will not be considered passage features on their own.
<b>GNIS</b>	Geographic Names Information System. The official repository of geographic names in the United States, managed by US Geological Survey.
<b>Horizontal Steward</b>	The agency or organization responsible for assembling and providing access to a statewide dataset of a particular type.
<b>Line</b>	A feature built of vectors connecting at least two points.
<b>Metadata</b>	Information about data sufficient to ascertain its quality and appropriate use.
<b>NSDI</b>	National Spatial Data Infrastructure. The effort of the FGDC to create and implement a shared data collection and maintenance resource for geospatial datasets.
<b>Site</b>	A location along a stream that contains one or more fish passage barrier features.
<b>Polygon</b>	Bounded surface for which the interior configuration is not directly specified.
<b>Positional Accuracy</b>	An assessment of the accuracy of the positions of spatial objects.
<b>Stream</b>	A body of running waters of this state moving over the surface of the land in a <i>channel</i> or <i>bed</i> including stream types classified as perennial or intermittent and channelized or relocated streams.
<b>Type</b>	Class of real world occurrences with common characteristics.
<b>Unique Identifier</b>	A reference code which is unique in the context for which it is used.
<b>Waters of the State</b>	Natural waterways including all tidal and non-tidal bays, intermittent and perennial streams, constantly flowing streams, lakes, wetlands and other bodies of water in this state, navigable and non-navigable.

## Appendix B: Data Dictionary

### Minimum graphic data elements

<b>Shape:</b>	Fish passage barrier feature point.
<b>fpbFtrID:</b>	Framework unique identifier for the fish passage barrier feature (generated by Horizontal Steward).
<b>fpbLong:</b>	“Longitudinal” planar component of point location on earth’s surface, in a known projection system (documented in metadata).
<b>fpbLat:</b>	“Latitudinal” planar component of point location on earth’s surface, in a known projection system (documented in metadata).
<b>fpbSiteID:</b>	Framework unique identifier for the fish passage barrier site (generated by Framework data steward). Multiple, associated fish passage barrier features may constitute a single site. Each site must contain at least one fish passage barrier feature.

### Minimum attribute or non-graphic data elements

<b>fpbRevDt:</b>	Date of data entry into or revision of the Framework dataset (YYYYMMDD). This will be populated as a complete date.
<b>fpbOFtrID:</b>	Unique ID for each fish passage barrier feature at a site, generated by the source originator / entity that provides the data.
<b>fpbONm:</b>	Name of source originator / entity that provides the data.
<b>fpbOSiteID:</b>	Unique ID for each fish passage barrier site, generated by the source originator / entity that provides the data.
<b>fpbLocMd:</b>	Method used to collect or generate location information.
<b>fpbLocAccu:</b>	Accuracy of fish passage barrier feature location (+ or – feet). Populate with “9999” if unknown.
<b>fpbLocDt:</b>	Most recent date of location data collection (YYYYMMDD). See business rule for dates that are only known to the month / year, the year or are unknown.
<b>fpbFtrTy:</b>	Fish passage barrier feature type. Debris jams should be recorded as “Other”.
<b>fpbFtrNm:</b>	Fish passage barrier feature name (see business rules for cases where the feature is unnamed or the name is unknown). The name should be derived from the GNIS if it exists, otherwise it may come from another source. Use the fpbFtrNmSr field to record the name source.
<b>fpbRmvDt:</b>	Date that fish passage barrier feature was removed (required only if removed). Note: fish passage barrier features that are removed will be tracked via previous records that are stored in the database. See business rule for dates that are known to the month / year, the year or are unknown.
<b>fpbMltFtr:</b>	Flag for whether multiple fish passage barrier features exist at the site (yes / no / unknown). This is typically used to identify the existence of multiple culvert barrels at a single road–stream crossing.
<b>fpbFPasSta:</b>	Status of Fish Passage at the fish passage barrier feature. Tracks passage status general to all species present and is not intended to store species-specific passage status information.

<b>fpbStaEvDt:</b>	Date Fish Passage status was last evaluated. See business rule for dates that are known to the month / year, the year or are unknown.
<b>fpbStaEvMd:</b>	Fish Passage status evaluation method. See business rule for cases where passage status is “unknown”.
<b>fpbFySta:</b>	Fishway status.

### **Optional graphic data elements**

None specified at this time.

### **Optional attribute or non-graphic data elements**

<b>fpbCrdDesc:</b>	Identifies exact location to which coordinates refer (e.g., centerline of road-stream crossing for a culvert).
<b>fpbStrID:</b>	Stream route identifier (Framework Hydrography).
<b>fpbStrMeas:</b>	Stream route measure (kilometers to 3 decimal places).
<b>fpbStrBMeas:</b>	Stream route begin measure – lines and polygons only (kilometers to 3 decimal places).
<b>fpbStrEMeas:</b>	Stream route end measure – lines and polygons only (kilometers to 3 decimal places).
<b>fpbStrNm:</b>	Stream name from GNIS.
<b>fpbRdID:</b>	Road route identifier (Framework – OR Road Centerline).
<b>fpbRdMeas:</b>	Road route measure (kilometers to 3 decimal places).
<b>fpbRdBMeas:</b>	Road route begin measure – polygons only (kilometers to 3 decimal places).
<b>fpbRdEMeas:</b>	Road route end measure – polygons only (kilometers to 3 decimal places).
<b>fpbRdNm:</b>	Road name from GNIS.
<b>fpbLocONm:</b>	Name of location data source originator / entity (if different from identification data originator). Location data include the following attribute elements: fpbLong, fpbLat, fpbLocMthd, fpbLocAccu, fpbLocDt, fpbCrdDesc, fpbStrID, fpbStrMeas, fpbStrNm, fpbRdID, fpbRdMeas, fpbRdNm and fpbLocMdD.
<b>fpbFtrSTy:</b>	Fish passage barrier feature subtype. Captures additional detail for the following feature types: dams, culverts, tide gates and fords.
<b>fpbFtrNmSr</b>	Fish passage barrier feature name source (GNIS or other).
<b>fpbHeight:</b>	Fish passage barrier feature height (feet, 1 decimal).
<b>fpbLenght:</b>	Fish passage barrier feature length (feet, 1 decimal). This distance is the measure between the furthest upstream and furthest downstream parts of the feature. Most commonly it is measured for culverts but could also apply to other feature types.
<b>fpbWidth:</b>	Fish passage barrier feature width (feet, 1 decimal). This distance is the measure between stream banks. This includes dam crest length.

<b>fpbSlope:</b>	Fish passage barrier feature slope (percent, 1 decimal).
<b>fpbDrop:</b>	Distance from culvert outlet to the water surface of the pool below (feet, 1 decimal).
<b>fpbOrYr:</b>	The year the fish passage barrier feature was built or installed. Natural barriers to be assigned year of statehood (1859) unless known to be otherwise.
<b>fpbModDt:</b>	Fish passage barrier feature modification date (YYYYMMDD). Note: passage modifications will be tracked via previous records that are stored in the database. See business rule for dates that are known to the month / year, the year or are unknown.
<b>fpbDesONm:</b>	Name of description data source originator / entity (if different from identification data originator). Description data include the following attribute elements: fpbFtrTy, fpbFtrSTy, fpbFtrNm, fpbRmvDt, fpbMltFtr, fpbHeight, fpbLength, fpbWidth, fpbSlope, fpbDrop, fpbOrYr, fpbModDt and fpbFtrTyD.
<b>fpbOwn:</b>	Owner of the fish passage barrier feature.
<b>fpbLOwn:</b>	Owner of the land where the fish passage barrier feature is located.
<b>fpbOperate:</b>	Operator of the fish passage barrier feature.
<b>fpbFyOwn:</b>	Owner of the fishway.
<b>fpbOwnTy:</b>	Fish passage barrier feature owner type.
<b>fpbLOwnTyp:</b>	Fish passage barrier feature landowner type.
<b>fpbOwnONm:</b>	Name of ownership data source originator / entity (if different from identification data originator). Ownership data include the following attribute elements: fpbOwn, fpbLOwn, fpbOperate, fpbFyOwn, fpbOwnTy, fpbLOwnTyp and fpbLOwnTyD.
<b>fpbFyTy:</b>	Fishway type. Note: culverts alone, even if they provide fish passage, are not considered fishways. See business rule for cases where fishways are associated with culverts.
<b>fpbFySTy:</b>	Fishway subtype.
<b>fpbFyOrYr:</b>	The year the fishway was built or installed (origin year).
<b>fpbFPasONm:</b>	Name of Fish Passage data source originator / entity (if different from identification data originator). Passage data include the following attribute elements: fpbFPasSta, fpbStaEvDt, fpbStaEvMd, fpbFySta, fpbFyTy, fpbFySTy, fpbFyOrYr, fpbEvMdFAD, fpbEvMdPAD and fpbFyTyD.
<b>fpbLocMdd:</b>	Fish passage barrier feature location collection method – description for “other”.
<b>fpbFtrTyD:</b>	Fish passage barrier feature type – description for “other”.
<b>fpbFtrSTyD</b>	Fish passage barrier feature subtype – description for “other”.
<b>fpbEvMdFAD:</b>	Fish passage status evaluation method – description for “other full assessment”.
<b>fpbEvMdPAD:</b>	Fish passage status evaluation method – description for “other partial assessment”.
<b>fpbFyTyD:</b>	Fishway type – description for “other”.
<b>fpbLOwnTyD:</b>	Fish passage barrier feature landowner type – description for “other”.

## Appendix C: Domain of Attributes

Fish passage barrier feature location collection method (fpbLocMd).

Code	Description
FieldGPS	Field – GPS
FieldQuad	Field – Record location on 7.5' quad map
FieldOther	Field – other
DigDerive	Digitally derived (e.g. located on-screen using DOQ or DRG)
ExtInv	External inventory (e.g. National Inventory of Dams, GNIS)
ProfJudge	Located on map via professional judgement (first-hand knowledge of feature location)
Other	Other
Unknown	Unknown

Fish passage barrier feature type code (fpbFtrTy) and feature subtype code (fpbFtrSTy).

Code	Description	Subtype Code	Subtype Description
Dam	Dam	DamPermanent	Dam that is permanent throughout the year.
		DamSeasonal	Dam that is in place for only part of the year.
Culvert	Culvert – road stream crossing	OpenArch	Open arch
		OpenBox	Open box
		Round	Round
		PipeArch	Pipe arch
		Full Box	Full box
		Other	Other known culvert shape
		Unknown	Unknown
WeirSill	Weir / sill	-	-
Falls	Falls	-	-
CascadeGradientVelocity	Cascades / gradient / velocity (incl. debris torrented reaches)	-	-
TideGate	Tide gate. See business rule for assigning subtypes.	SideHingedAluminum	Side-hinged orientation, aluminum material, not mechanically controlled
		TopHingedIronSteel	Top-hinged orientation, iron or steel material, not mechanically controlled
		TopHingedWood	Top-hinged orientation, wood material, not mechanically controlled
		MechanicallyControlled	Mechanically controlled.
		Other	Other known tide gate hinge-orientation, material or controls.
		Unknown	Unknown.
Bridge	Bridge – road stream crossing	-	-
Ford	Ford – road stream crossing	Concrete	Concrete
		Asphalt	Asphalt
		NativeMaterial	On-site, native material
		Off-site rock	Off-site rock
		Other	Other known surface material

Code	Description	Subtype Code	Subtype Description
		Unknown	Unknown
Other	Other known fish passage barrier feature including debris jams.	-	-
Unknown	Unknown	-	-

Passage status code (fpbFPasSta).

Code	Description
Blocked	Not passable
Partial	Partially passable – a barrier to at least some fish at some time.
Passable	Completely passable
Unknown	Unknown

Passage status evaluation method (fpbStaEvMd).

Code	Description
USFSBLMFullAssess	USFS / BLM full passage assessment (e.g. FishXing)
OtherFullAssess	Other full passage assessment
USFSBLMPartialAssess	USFS / BLM partial passage assessment (coarse screen filter)
OtherPartialAssess	Other partial passage assessment (including professional judgement)
ByDesign	By evaluation of design plans
Unknown	Unknown
NA	Not applicable

Fishway status code (fpbFySta).

Code	Description
FuncOkay	Functioning – either meets criteria or it is unknown whether it meets criteria
FuncNonCrit	Functioning – does not meet current criteria
NeedsMaint	Needs repair or maintenance - either meets criteria or it is unknown whether it meets criteria
NeedsMaintNonCrit	Needs repair or maintenance and does not meet current state or NMFS fish passage criteria
Abandoned	Abandoned fishway - no longer needed (e.g. fishway at natural falls)
None	No fishway
NoneMitigation	No fishway – mitigation provided
NoneExempt	No fishway – negligible current benefit
NoneConflict	Fishway not wanted – conflicts with other native fish management needs
Unknown	Unknown

Fishway type code (fpbFyTy) and fishway subtype code (fpbFySTy).

<b>Code</b>	<b>Description</b>	<b>Subtype Code</b>	<b>Subtype Description</b>
Pool	Pool style fishways have a series of distinct pools in which the energy of the flow entering each one is entirely dissipated prior to flowing to the next.	PoolVertSlot	Vertical slot
		PoolAndWeir	Pool and weir
		PoolWeirOrifice	Weir and orifice
		PoolSecChan	Engineered secondary channel
		PoolOther	Pool -other
BaffledChute	Chutes or flumes with roughness, designed to reduce velocity, allowing fish passage.	BChuteAKSteep	Alaska Steeppass
		BChuteDenil	Denil
		BChuteSecChan	Engineered secondary channel
		BChuteOther	Baffled chute - other
Hybrid	Combination of multiple fishway types.	HybridPoolChute	Pool and chute
		HybridSecChan	Engineered secondary channel
		HybridOther	Hybrid - other
FullSpanning	A fishway that crosses the entire stream channel.	FISpanRockWeir	Rock weirs
		FISpanLogWeir	Log weirs
		FISpanConcreteWeir	Concrete weirs
		FISpanOtherWeir	Full spanning - other weirs
		FISpanRoughChan	Roughened channel
		FISpanHybridChan	Hybrid channel
		FISpanOtherChan	Full spanning - other channel
Trap	Structures that direct the stream flow to attract upstream migrants into holding (impoundment) areas.	TrapPass	Trap and pass – includes mechanical lifts / locks.
		TrapHaul	Trap and haul
Other	Other known fishway type	-	
Unknown	Unknown fishway type	-	

Owner type (fpbOwnTy) and Landowner type (fpbLOwnTy).

<b>Code</b>	<b>Description</b>
Federal	Federal
State	State
Tribal	Tribal
Private	Private
PubUtility	Public Utility
PubSpDistrict	Special district - water control, irrigation, drainage
County	County
City	City
Other	Other

## Appendix D: Business Rules

### General

#### Originator Names (for Location, Description, Ownership and Passage)

Data originators have the option of submitting separate source information for the location, description, ownership and fish passage-related elements of a fish passage barrier feature. If all elements of the record come from the same source (fish passage barrier originator name), then each of these four “other” originator fields can be populated with a value = “same”.

#### Dates (fpbLocDt, fpbRmvDt, fpbStaEvDt, fpbModDt)

Data originators should populate these date elements as completely as possible; however, partial date information will be accepted. If the month and year are known, use zeros to populate the day portion of the date element. If only the year is known, use zeros to populate the month and day portion of the date element. If the date is unknown, use zeros to populate the entire element (e.g. 20011200, 20010000, 00000000).

### Identification

#### Fish Passage Barrier Feature Identifier (fpbFtrID)

Fish passage barrier features that obstruct or potentially obstruct fish passage will have unique identifiers assigned to them. Features such as fishways, which are designed to facilitate passage at an obstruction, will NOT have a separate passage identifier (fpbFtrID) value assigned. Fishways will be tracked via an attribute that is associated with a specific fish passage barrier feature.

#### Fish Passage Barrier Data Revision Date (fpbRevDt)

Any change to the record would necessitate an update to the fish passage barrier data revision date (fpbRevDt) field.

#### Fish Passage Barrier Originator Name (fpbONm)

Fish passage barrier data originator names will be submitted by each originator, but will then be standardized by the Horizontal Steward (e.g., USFS – region, USFS – Mt Hood). The Horizontal Steward will share this information back to the data originators to ensure consistency for future data submissions.

#### Fish Passage Barrier Originator Feature Identifier (fpbOFtrID)

If the data originator identifies a site as having multiple features, it will be required to uniquely identify each of the fish passage barrier features at the site using the fpbOFtrID. If the site does not have multiple features, the fpbOSiteID and the fpbOFtrID may be the same.

### Location

#### Fish Passage Barrier Feature Longitude and Fish Passage Barrier Feature Latitude (fpbLong and fpbLat)

Fish passage barrier feature coordinates will not be required to be based on a standard datum; however, the datum must be specified in the metadata.

Fish Passage Barrier Location Accuracy (fpbLocAccu)

A minimum positional accuracy for fish passage barrier locations is not required by this standard, however, where it is known, the positional accuracy (+ or – feet) should be specified. A recommended minimum positional accuracy should reflect National Map Accuracy Standards for the 1:24,000 USGS quadrangle series (+ / – 40 feet for 95% of well-known features). The value of “9999” will be a valid value in the domain of this element for features with a location accuracy of “unknown”.

Fish Passage Barrier Stream Identifier (fpbStrID)

Stream identification information will be based on the standard Framework Hydrography routing system.

*The use of the single Framework standard will be tested and if multiple route systems are determined to be necessary, then this business rule may need to be changed and additional attributes (e.g. route\_system\_id) added.*

Fish Passage Barrier Road Identifier (fpbRdID)

Road identification information will be based on the Framework Oregon Road Centerline standard.

*The use of the single Framework standard will be tested and if multiple route systems are determined to be necessary, then this business rule may need to be changed and additional attributes (e.g. road\_system\_id) added.*

**Description**Fish Passage Barrier Feature Name (fpbFtrNm)

Some fish passage barrier feature types (e.g., dams) have names while other fish passage barrier feature types (e.g., culverts) do not. In cases where it is known that a fish passage barrier feature does not have a name, this element should be populated with “Unnamed <feature type>” (e.g., Unnamed culvert). Where a feature might have a name (e.g., falls), but it is not known, this element should be populated with “Unknown”. Where GNIS names exist they should be used, otherwise alternative sources for names may be used. Name source information should be tracked using the fpbFtrNmSr element.

Fish Passage Barrier Feature Subtype (fpbFeatSTy)

Tide gate codes are not mutually exclusive. If a tide gate is mechanically controlled, assign that code first, otherwise choose from the remaining categories.

**Passage**Fish Passage Status Evaluation Method (fpbStaEvMd)

Where passage status (fpbFPasSta) = “Unknown”, populate the fpbStaEvMd element as “NA”.

Fish Passage Barrier Fishway Type and Subtype (fpbFyTy and fpbFySTy)

Fishways should only be associated with a culvert if there is an additional built structure for fish passage purposes (e.g., fish ladder, full-spanning weirs, or a roughened channel) that is not within or under the culvert barrel.