

# *Fish Distribution Editing Tool:*

*Web-based Tools for Complex Spatial Data*

Bill Daigle

Montana Fish, Wildlife & Parks

# A brief history of time...

---

- 1960s - Fisheries Bureau started centralizing data
- 1980s - Data computerized
  - NW Power Act ->
  - Montana Rivers Study->
  - Montana Rivers Information System ->
  - StreamNet
- 1988 – 2,056 stream miles recommended by Montana be protected for fish and/or wildlife values
- 1999 - Data became available on the web
  - Montana Fisheries Information system

# Data management

---

- Raw sample data
  - Over 80 fish species
  - 14,118 streams and rivers
  - 5162 lakes and reservoirs
- Variety of data types and sample methods
- Stored centrally and managed via web editor.

# Fisheries Information System

[Home](#) [Code Table Administration](#) [Downloads](#) [Commercial Sales](#) [Hatch System](#)

Home

View, Edit or Enter  
Data

Search by FWP Project

Search for Tagged  
Fish

ESA Section 6  
Reporting

6 Year Plan

Search Stocking  
Records

Tools

Species Distribution

References

Related Files

## Welcome to the Fisheries Information System

- Questions? Check out the Updated Godzilla FAQ's under "Downloads"
- If you can't find an answer in the FAQ's (under "Downloads"), contact David Schmetterling: 542-5514 or [dschmetterling@mt.gov](mailto:dschmetterling@mt.gov)



[Mozilla FireFox](#) is recommended for using this application. Please click this line to view things that can effect the application.

# Fisheries Information System

[Home](#) [Code Table Administration](#) [Downloads](#) [Commercial Sales](#) [Hatch System](#)

[Home](#)

[View, Edit or Enter Data](#)

[Survey and Inventory](#)

[Analysis Tools](#)

[Fish Tagging](#)

[Data Logging](#)

[Spawning Surveys](#)

[Remote Site Incubator \(RSI\) Data](#)

[Fish Kill Report](#)

[Search by FWP Project](#)

[Search for Tagged Fish](#)

[ESA Section 6 Reporting](#)

[6 Year Plan](#)

[Search Stocking Records](#)

[Tools](#)

[Species Distribution](#)

[References](#)

[Related Files](#)

## Clark Fork River

[view map](#)

Region :?

OutFlow to :?

Drainage :?

Sub Basin :?

Counties:?

[Survey and Inventory](#)

[Analysis Tools](#)

[Fish Tagging](#)

[Data Logging](#)

[Spawning Surveys](#)

[Remote Site Incubator \(RSI\) Data](#)

[Fish Kill Report](#)

[Water Details](#)

[Fish Plants](#)

[6 Year Plan](#)

[Inspections](#)

[Barriers and Dams](#)

View  Edit

### Alias:

### Description:

The Clark Fork River has its headwaters in the Silver Bow (or Highland) Mountains, originating at the confluence of Silver Bow and Warm Springs creeks near Anaconda, Montana. The river flows north and west 350 miles through broad, semi-arid valleys, high mountain ranges, and steep-sided valleys and terminates in Lake Pend Oreille, Idaho. The Upper Clark Fork, bordered on the north by the Garnet Range and on the south by the Flint Creek Range, meanders most of its first 38 miles through the flat plains of the Deer Lodge Valley. Vegetation is sparse, due partly to the effects of the mining boom, the greatest historical influence in the Upper Basin. Downstream from the mouth of the Little Blackfoot River, the river flows through a steep, narrow canyon. Between Garrison and Jens the river channel has been shortened by highway and railroad construction activities, but past Jens the Clark Fork meanders away from the transportation corridor and native trees and shrubs appear along its banks. From below Flint Creek the river runs 26 miles through Bearmouth Canyon to emerge and widen to 150 feet for its final miles to the former Milltown Reservoir. The Middle Clark Fork River extends about 115 river miles from its confluence with the Blackfoot River to its confluence with the Flathead River and is entirely free flowing. Its drainage is mountainous and covered with large forested tracts, broken by grazing and cropland areas in the lower valleys. From Thompson Falls Dam, its upper boundary, the Lower Clark Fork River flows through sedimentary formations and a landscape sculptured by the massive outflows of glacial Lake Missoula. It runs into Cabinet Gorge Dam, just outside the Montana border. Between the backwaters of Cabinet Gorge and the tailwaters of Thompson Falls Dam the river is inundated by Noxon Rapids Dam. When the Clark Fork crosses the Idaho border, it is Montana's largest river, carrying an average 22,060 cubic feet of water per second.

### District:

### Drainage:

Clark Fork River-Bear Creek (1701020206)  
Clark Fork River-Cabinet Gorge Reservoir (1701021313)  
Clark Fork River-Cramer Creek (1701020214)  
Clark Fork River-Deerlodge (1701020107)  
Clark Fork River-Dry Creek (1701020407)  
Clark Fork River-Gold Creek (1701020108)  
Clark Fork River-Lynch Creek (1701021305)  
Clark Fork River-Mill Creek (1701020402)  
Clark Fork River-Rattlesnake Creek (1701020401)  
Clark Fork River-Trout Creek (1701020406)  
Clark Fork River-Warm Springs (1701020104)  
Lower Noxon Reservoir (1701021310)  
Upper Noxon Reservoir (1701021309)

**Latitude:** 48.08909

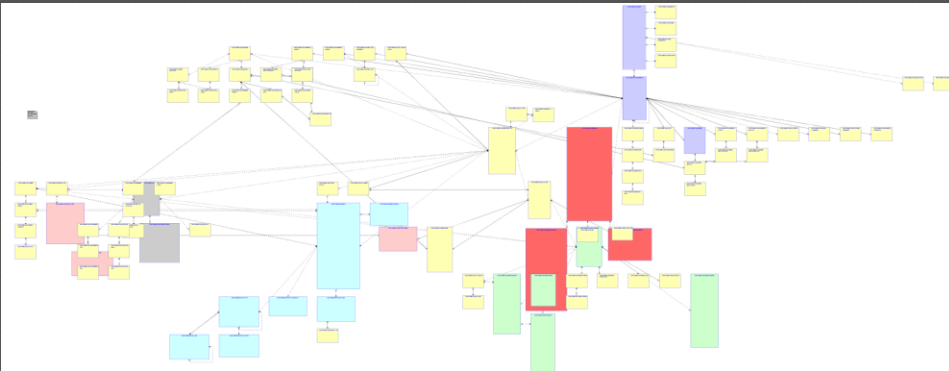
**Longitude:** -116.04863

**Internal Notes:**

**Directions:**

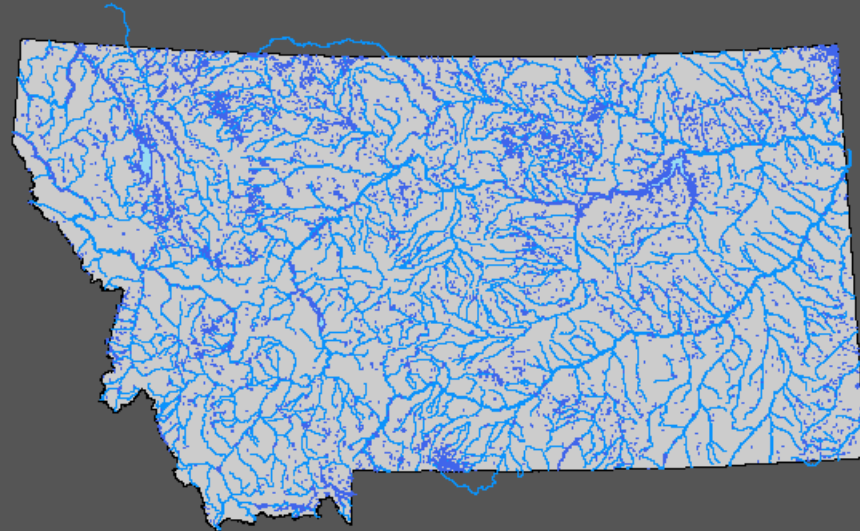
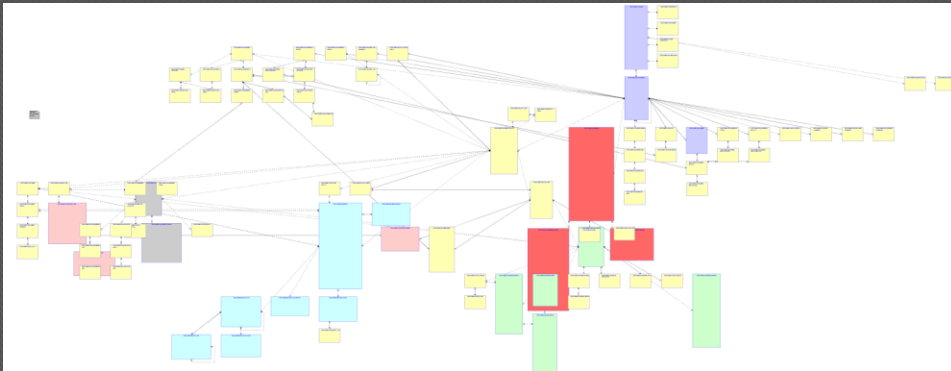
# Data types

---

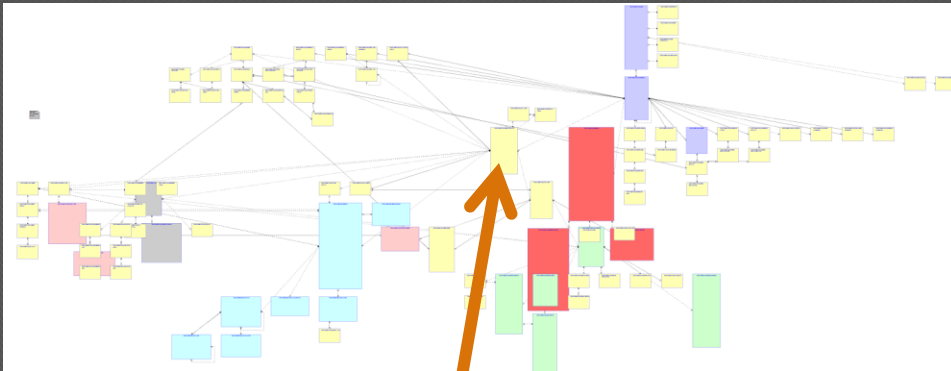


# Data types

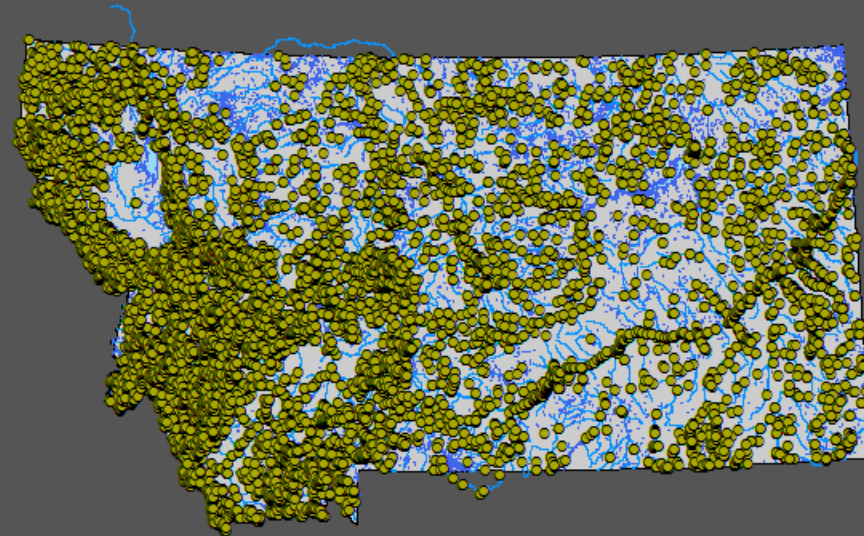
---



# Data types

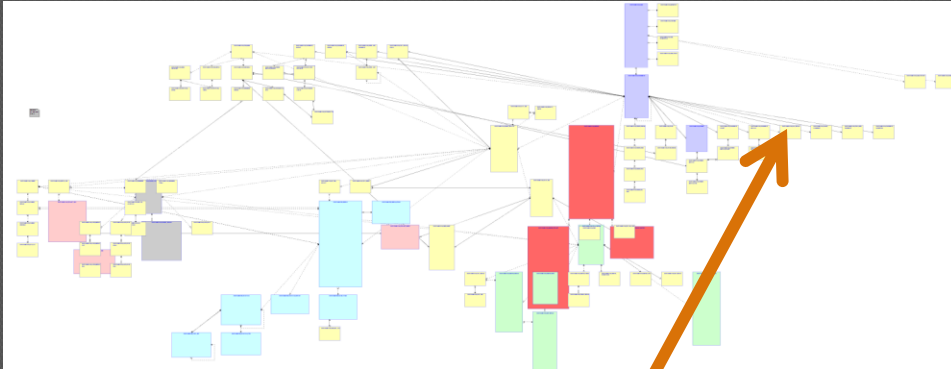


● Population Survey Location

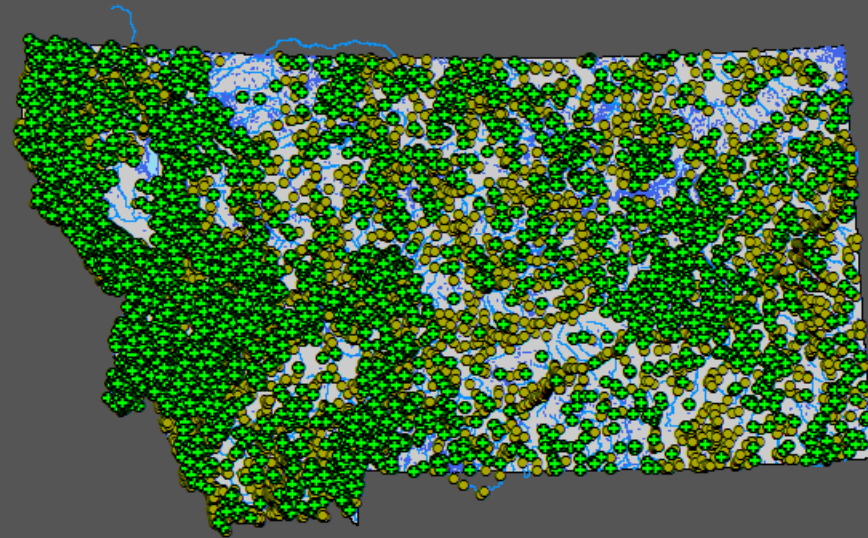




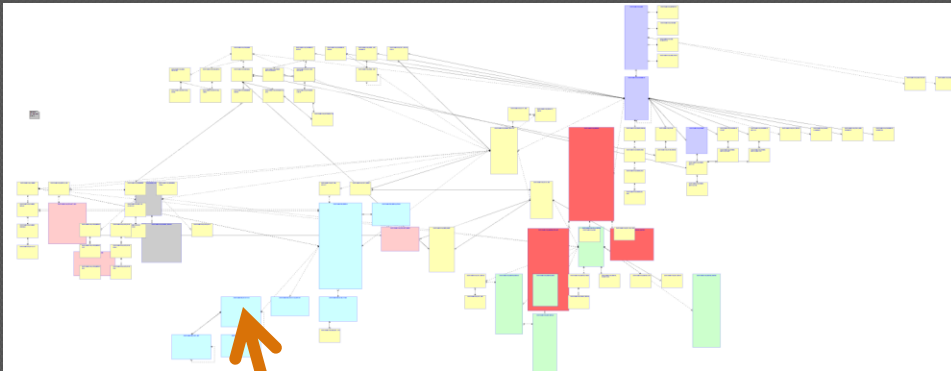
# Data types



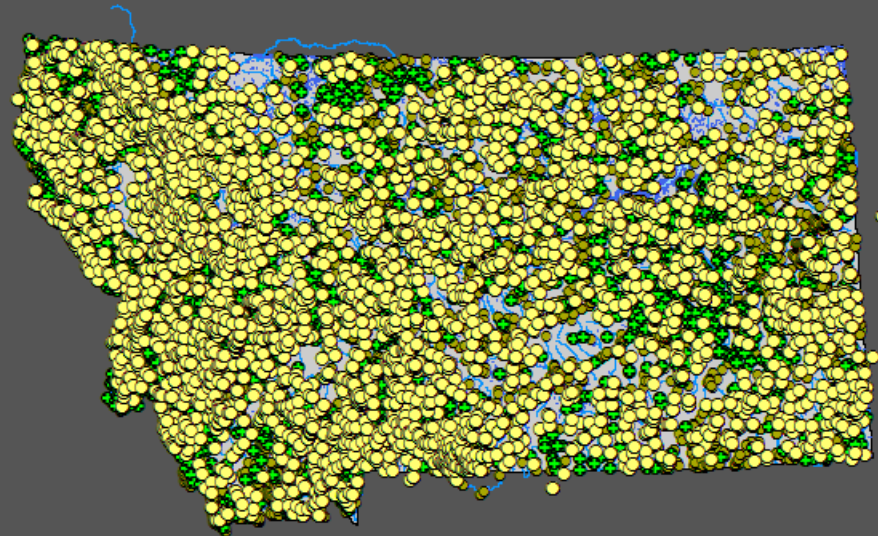
- Barries
- Popluation Survey Location



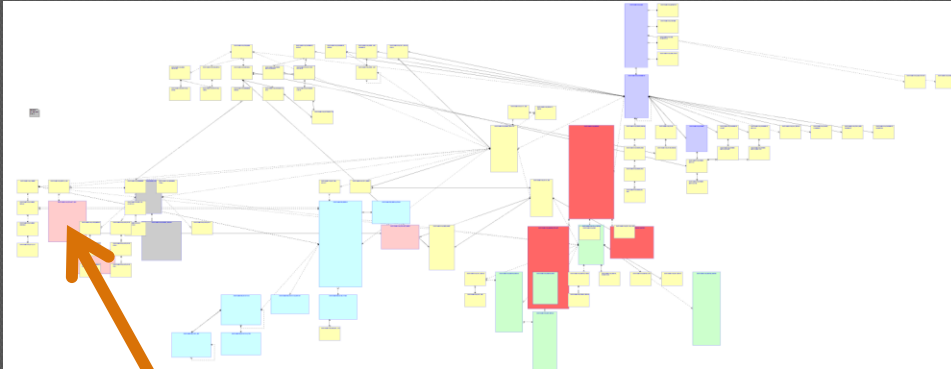
# Data types



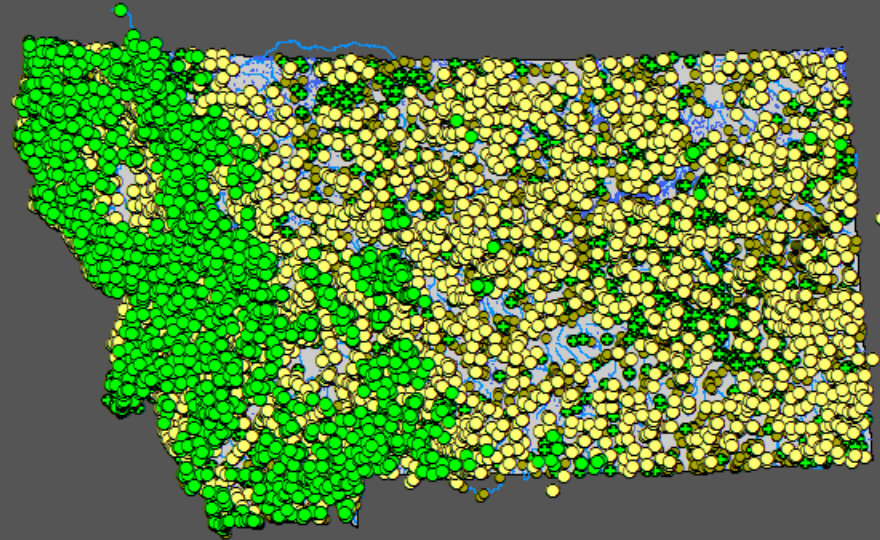
- Stocking Sites
- Barries
- Popluation Survey Location



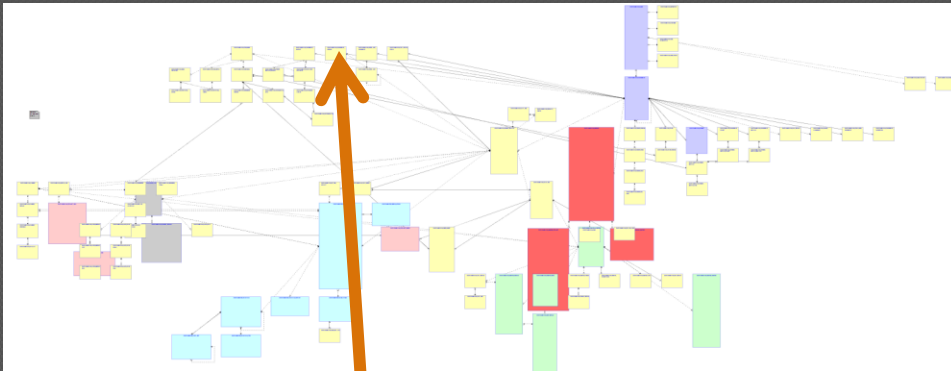
# Data types



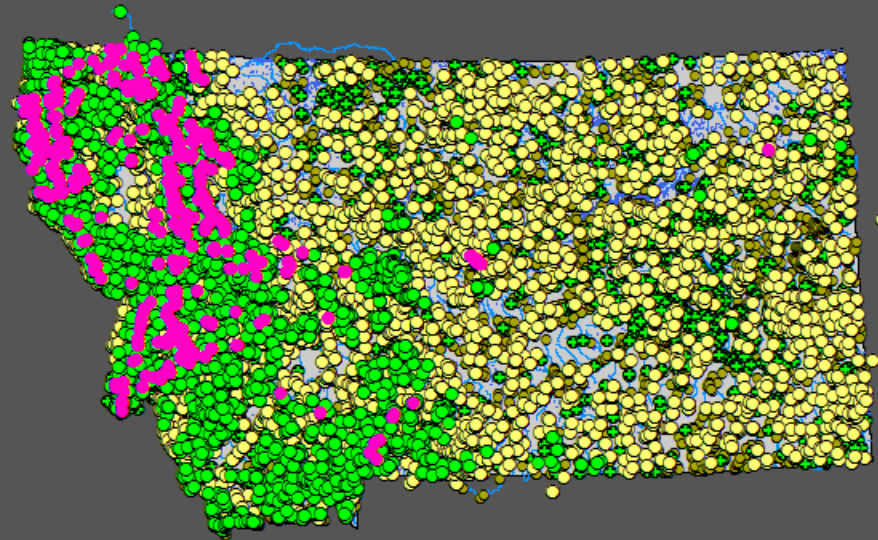
- Genetic Samples
- Stocking Sites
- Barries
- Popluation Survey Location



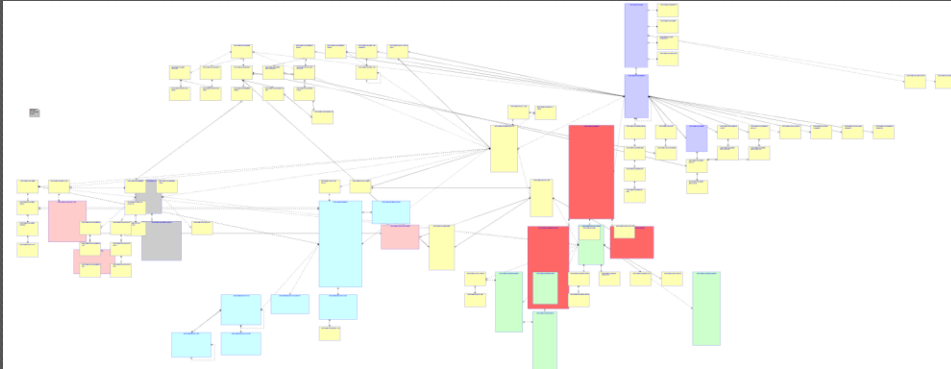
# Data types



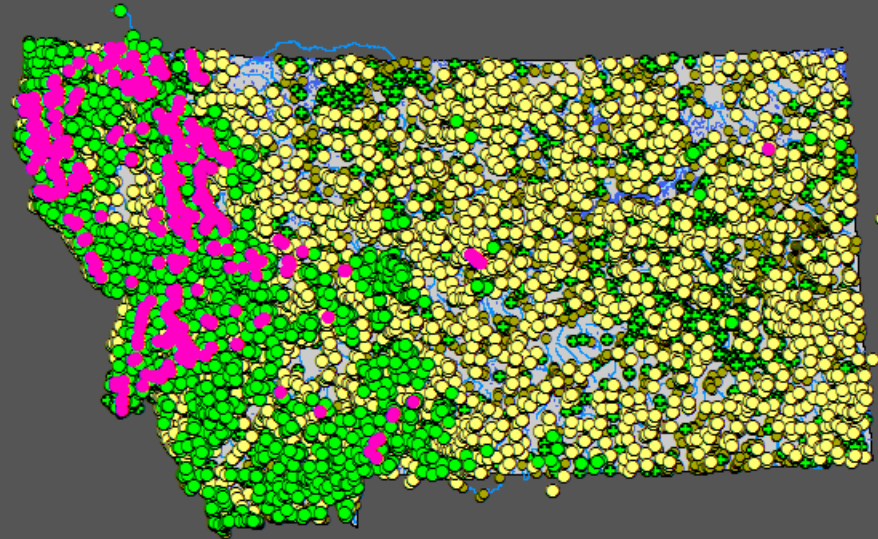
- Spawning Sites
- Genetic Samples
- Stocking Sites
- Barries
- Popluation Survey Location



# Data types



- Spawning Sites
- Genetic Samples
- Stocking Sites
- Barries
- Popluation Survey Location



# Fish distribution – management and use

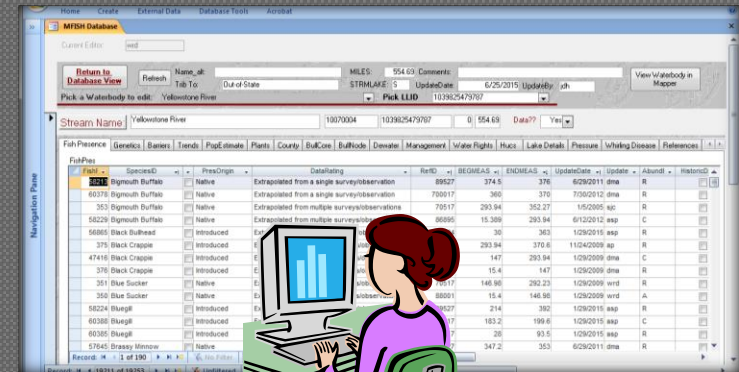
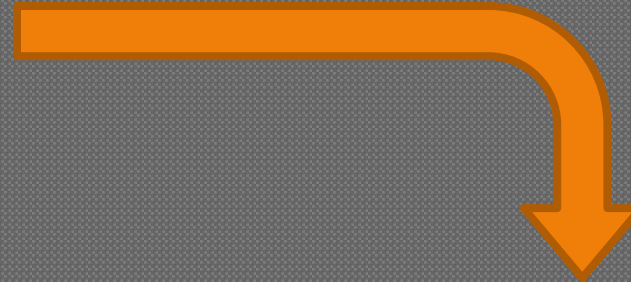
---

- Distillation of hard data and professional opinion
- Generalized and extrapolated
- Uses:
  - QA/QC of field data
  - Map production
  - Public download
  - Statewide and region-wide assessment
- Challenge to maintain:
  - 80 species X 5 attributes 25 biologists = 10,000 combinations



## Old Process

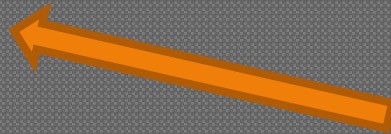
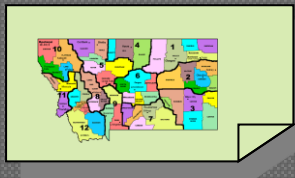
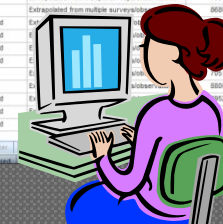
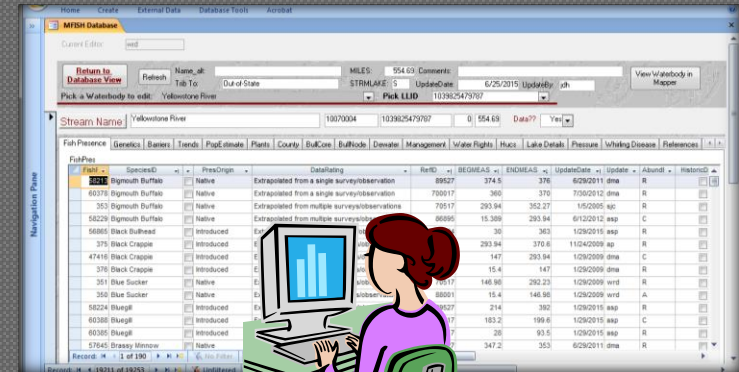
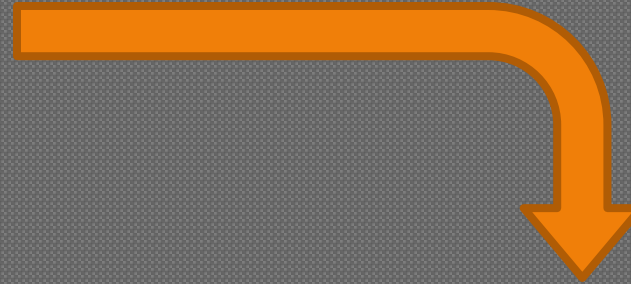
Manual: lots of intervention from data services staff



## Old Process

Manual: lots of intervention from data services staff





**Route Features**

**Old Process**

Manual: lots of intervention from data services staff



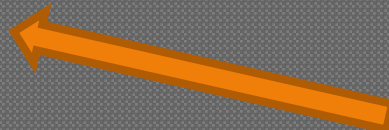
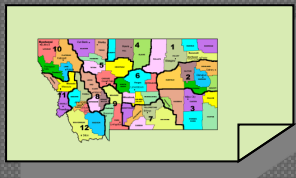
MFRM Database

Stream Name: Yalovatore River | 1007004 | 1078625479707 | 554.69 | Data?? | Yes

FishPis	SpeciesID	PresOrigin	Datating	RefID	BEQHEAS	ENQHEAS	UpdateDate	Update	Abund	History
60378	Dipnoth Buffalo	Native	Extrapolated from a single survey/observation	85227	374.6	376	6/25/2011	ama	R	
353	Dipnoth Buffalo	Native	Extrapolated from a single survey/observation	70017	360	370	7/30/2012	ama	R	
58229	Dipnoth Buffalo	Native	Extrapolated from multiple survey/observations	70517	293.94	352.27	1/5/2005	gc	R	
58229	Dipnoth Buffalo	Native	Extrapolated from multiple survey/observations	66995	15.389	293.94	6/12/2012	asp	C	
58885	Black Bullhead	Introduced		30	363	1/29/2015	asp	R		
370	Black Crappie	Introduced		293.94	376.6	1/16/2009	sp	R		
47416	Black Crappie	Introduced		147	293.94	1/29/2009	ama	C		
370	Black Crappie	Introduced		15.4	147	1/29/2009	ama	R		
351	Blue Sucker	Native		10517	148.90	292.23	1/29/2009	wrd	R	
350	Blue Sucker	Native		80001	15.4	148.90	1/29/2009	wrd	A	
60224	Bluegill	Introduced		70517	274	382	1/29/2015	asp	R	
60380	Bluegill	Introduced		17	183.2	199.6	1/29/2015	asp	C	
60380	Bluegill	Introduced		17	28	93.5	1/29/2015	asp	R	
57645	Drassy Minnow	Native		347.2	353	6/29/2011	ama	R		

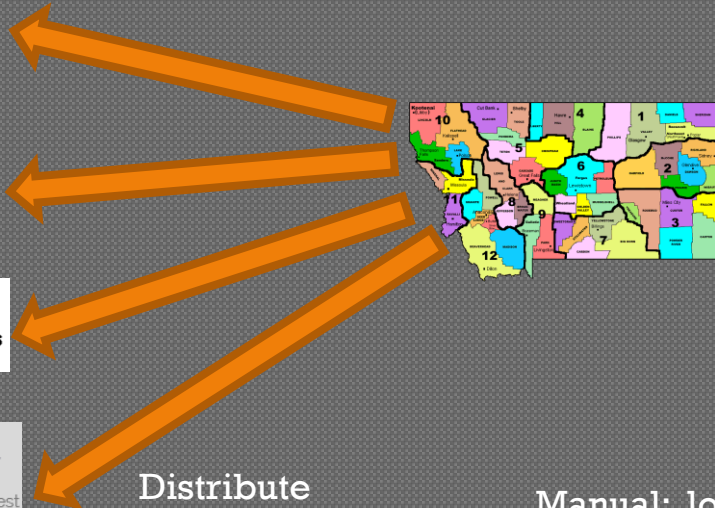
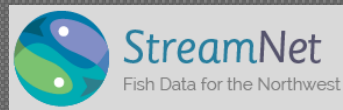
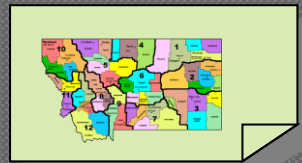
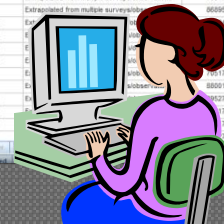
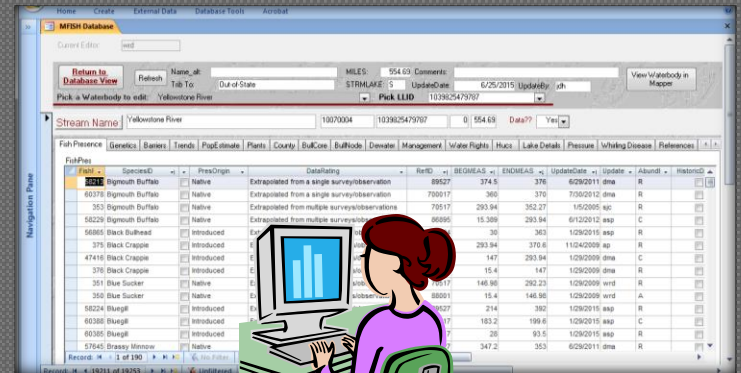


Review



Old Process

Manual: lots of intervention from data services staff



Old Process

Manual: lots of intervention from data services staff

# Web-based waterbody location editor

---

- Decrease to time/energy to update layers
  - Enable the data owners
  - Decrease dependency on GIS staff
- Designed around editing fish distributions
- Extends to other data types:
  - Fishing regulations
  - Boating regulation
  - Waterbody classifications

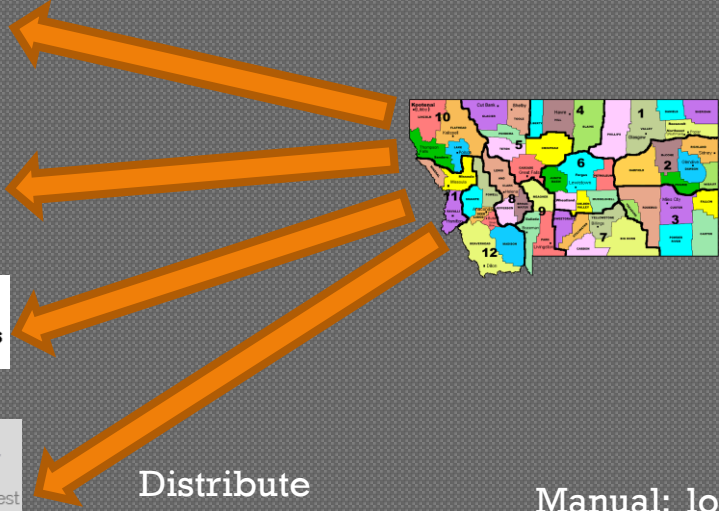
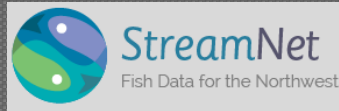
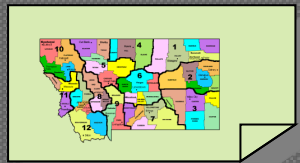
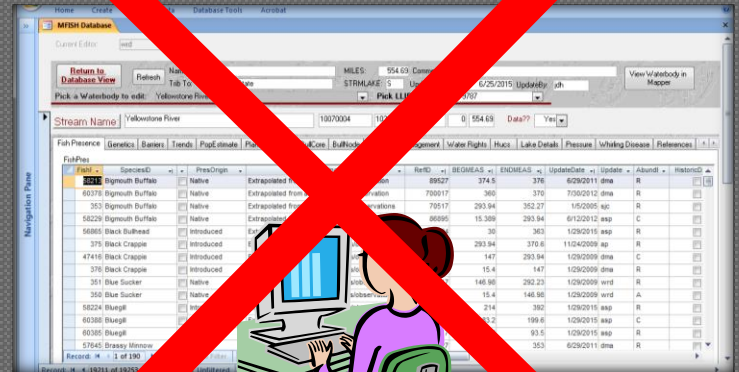
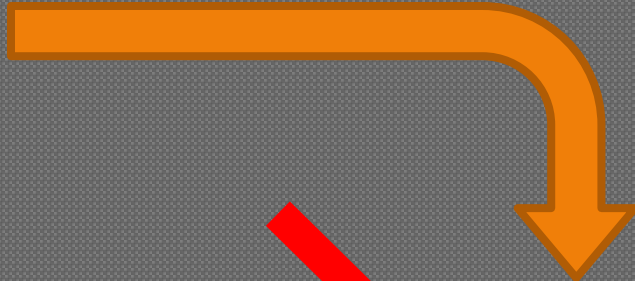
# Requirements

---

- Easy to use
- Map based
- Dynamic
- Responsive
- Accommodate existing data



ask  
@  
Biologist



Old Process

Manual: lots of intervention from data services staff



**Species Distribution**

Species: Arctic Grayling  
Attribute Group: Abundance

Layers Legend Distribution Editor


**Step 3:** Select the waterbodies that you want included in the edit via the table below. Included waterbodies will be updated to: Common

Edit?	Stream	Miles
<input checked="" type="checkbox"/>	Thompson Creek	10.08
<input type="checkbox"/>	East Fork Thompson Creek	5.16
<input type="checkbox"/>	Clam Creek	3.76
<input type="checkbox"/>	Howell Creek	3.69

Edit?	Lake	Acres
<input checked="" type="checkbox"/>	Mystic Lake	18.84
<input type="checkbox"/>	Lion Lake	6.64500
<input type="checkbox"/>	Continental Lake	4.053
<input type="checkbox"/>	Crystal Lake	2.73500

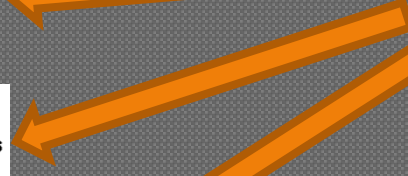
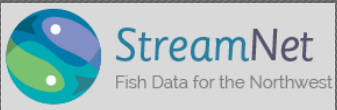
Save Edits Cancel



## New Process

Puts the responsibility in the hands of the biologist

Distribute



# Demo

Video available at:

<https://github.com/MFWP-GIS/waterbodyLocationEditor/blob/master/Distribution%20Editor%20-%20Nov%202017%202015%2010.22.29%20AM.wmv>



# Table structure

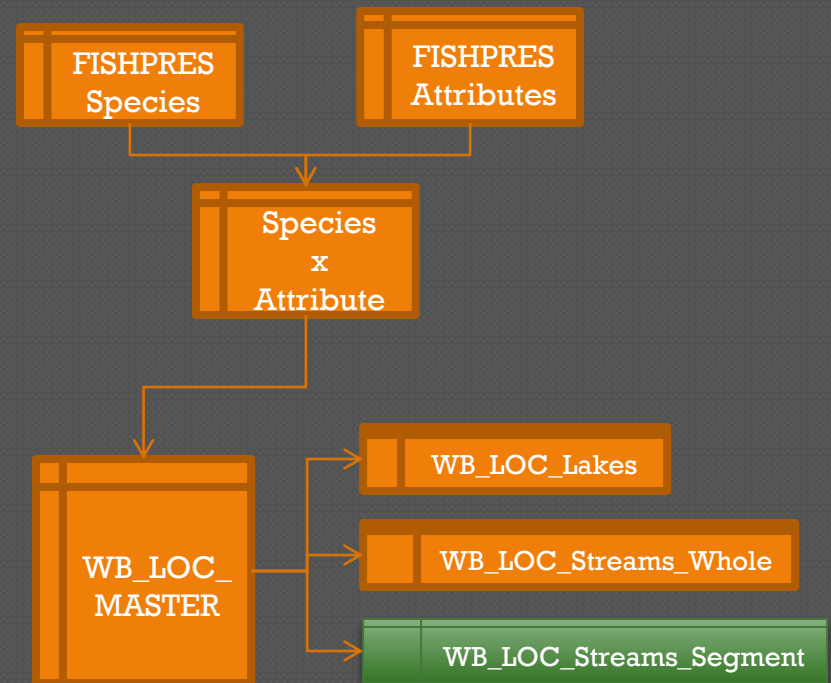
## OLD

- Flat file
- All attributes as fields
- Spatial “snap shots”



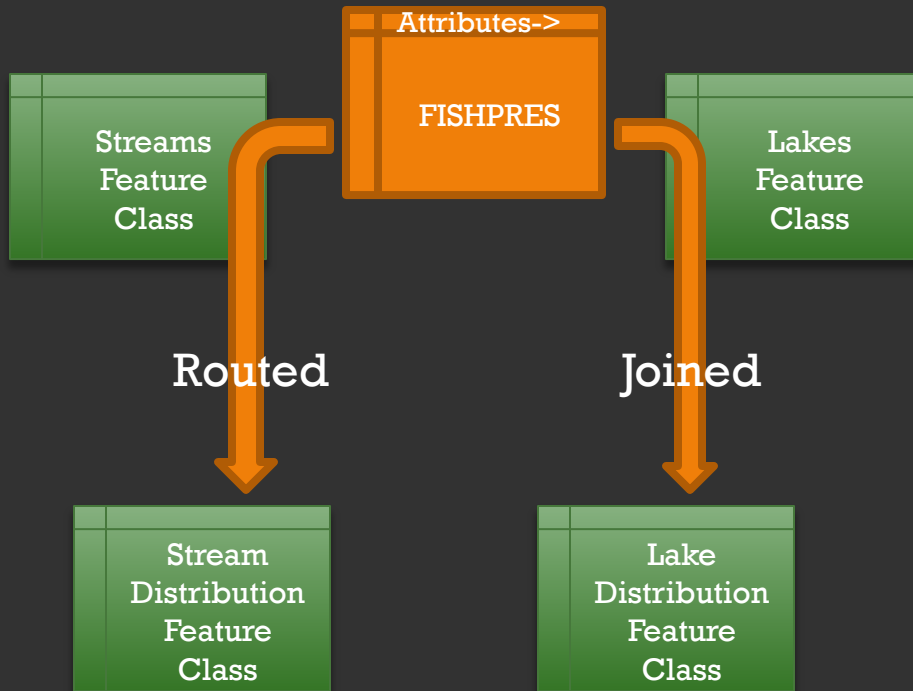
## NEW

- Normalized
- Attributes as records
- Live views



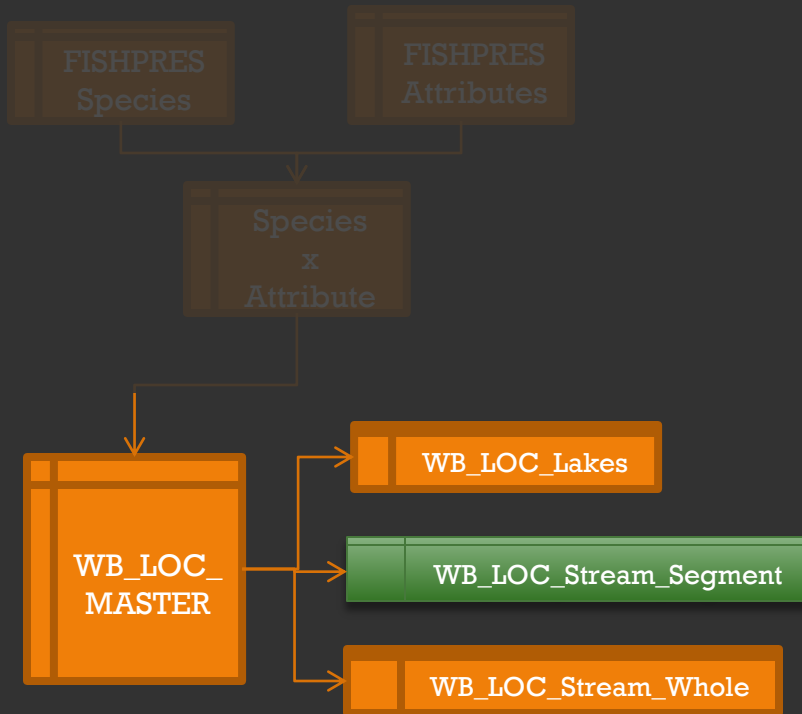
# Producing spatial layers

The Old Way (static “snap shots”)



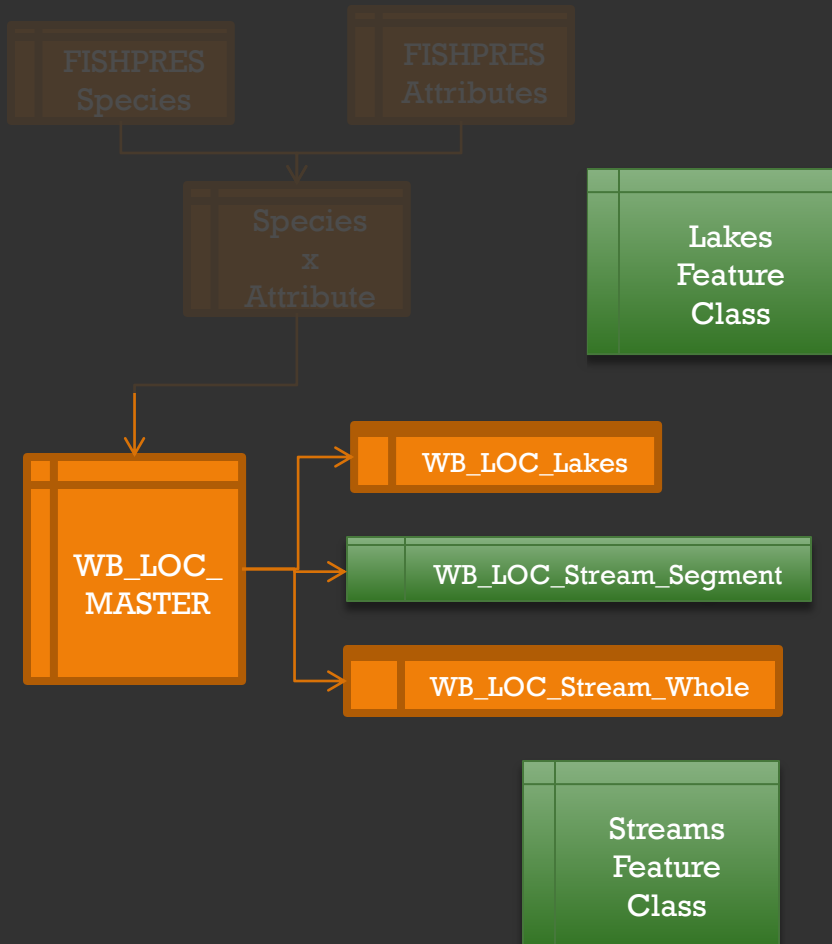
# Producing spatial layers

The New Way (dynamic views)



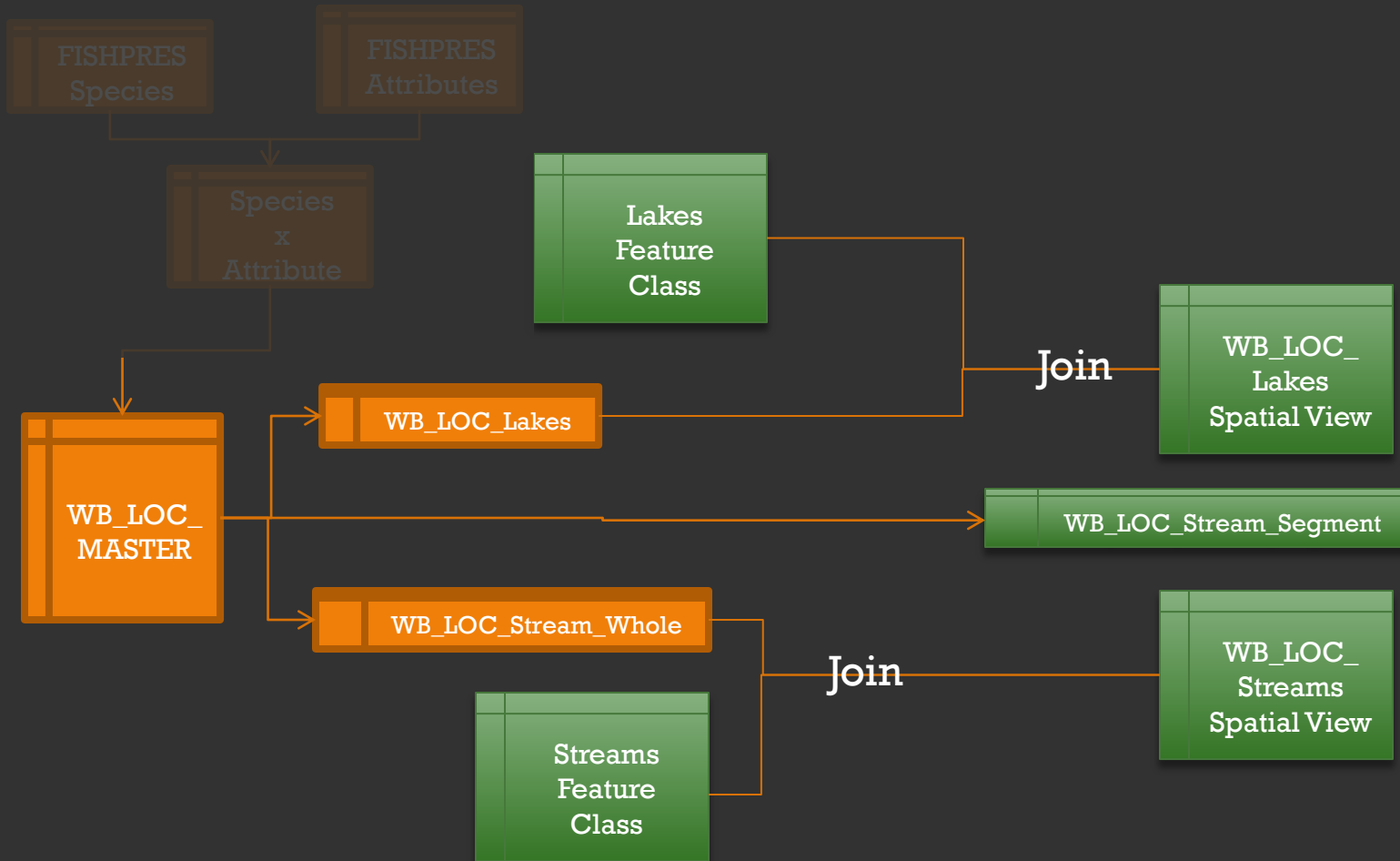
# Producing spatial layers

The New Way (dynamic views)



# Producing spatial layers

The New Way (dynamic views)



# ArcGIS Server Components

---

- ◉ Versioned geodatabase
- ◉ One Map Service
  - With dynamic workspaces enable
- ◉ One Geoprocessing Service
  - Fetches data about record ID's and symbology
  - Performs geometry clips and returns the clipped geometry
  - Applies edits and ensures data integrity

# Web Server Components

---

- Map application
  - Used existing map components
  - Fish distribution specific form elements
- Waterbody location display widget
  - Interacts with the Map Service
  - Can be used outside of edit application
- Waterbody location editor widget
  - Interacts with the geoprocessing service

# Yet to come...

---

- **Interface improvements:**
  - Edit multiple attributes with a single edit
- **Additional map layers**
  - Make more informed decisions
- **Better integration with other data entry screens**
  - Triggers to validate when new species is surveyed
- **Integrate into other data entry systems**
  - Regulations, Survey locations, waterbody classifications



# “Git it” on GitHub

---

- ◉ <https://github.com/MFWP-GIS/waterbodyLocationEditor>
- ◉ Presentation
- ◉ Sample code available soon
- ◉ Questions? [bdaigle@mt.gov](mailto:bdaigle@mt.gov)