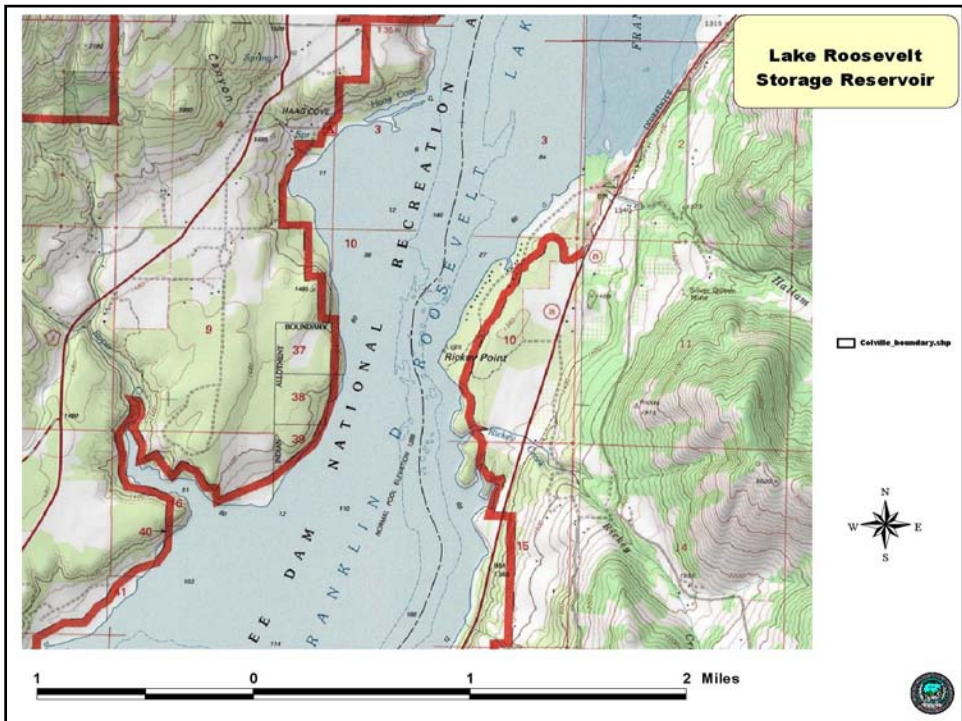
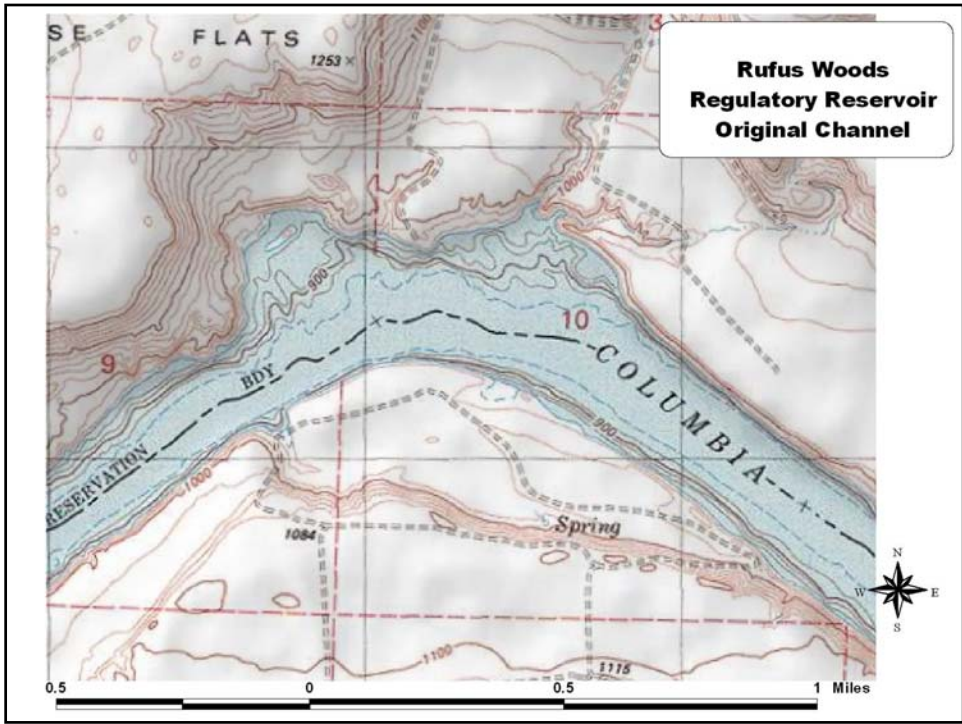


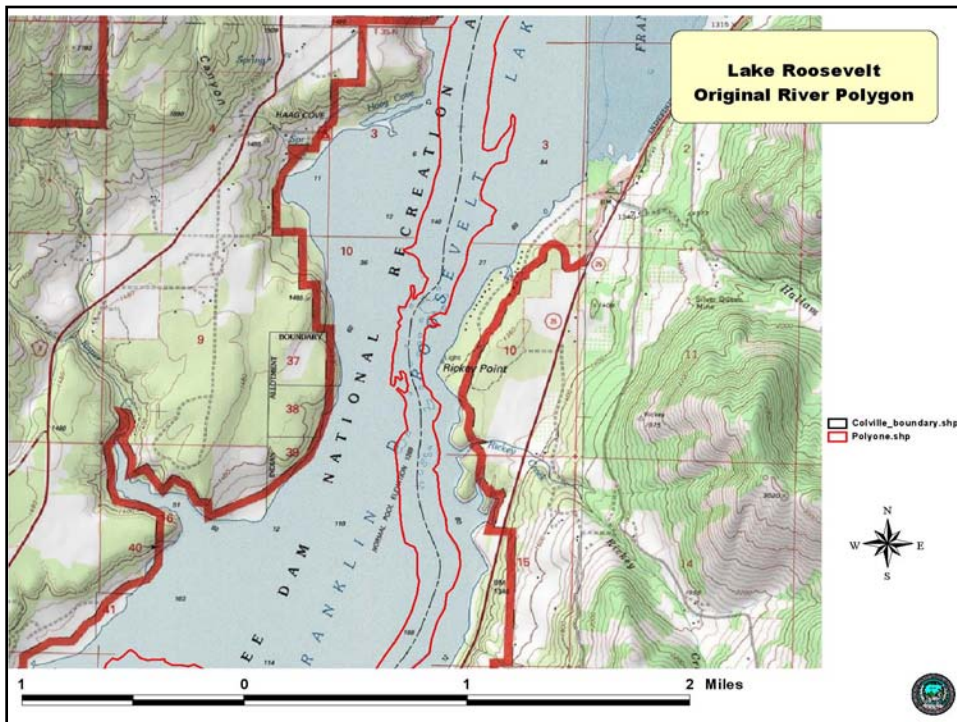
Proposed Methodology for Aquatic Habitat Loss Assessment

Prepared by the
CBFWA
Resident Fish Advisory Committee

Full Circle RFAC looked at several options

- Habitat gained
- Alterations in habitat
- Ecological approach
- Weighting of habitat
- Variations between different types of reservoirs and streams
- Loss of habitat features (islands, falls, side channels)





Area or Lineal Calculations

- Neither area or lineal works for all areas
- Managers will determine which is best method of the two for their area
- GIS calculations will be standardized
- Free of subjective judgments
- Will work for all stream classes

Determine Area Impacted

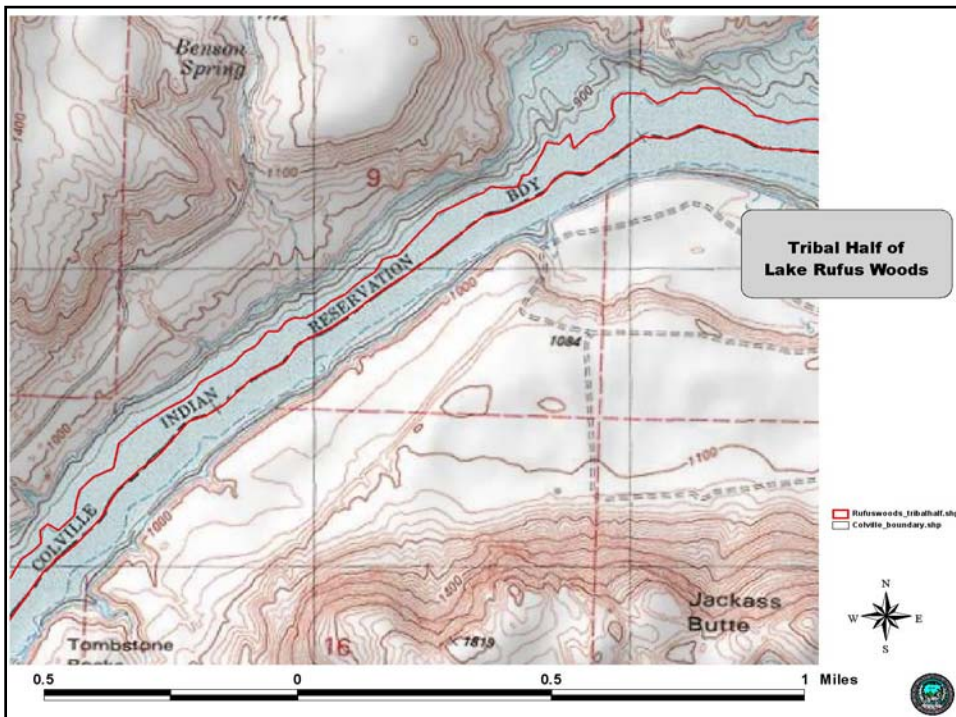
- How many kilometers or acres of river were lost to inundation from hydro-power construction
- How many kilometers or acres of aquatic habitat in tributaries was lost from hydro-power construction

Determine Extent of Habitat

- Do natural barriers exist that were the end of fish passage?
- Did gradient create barrier?
- Calculate length of stream
- Determine average channel width
- Calculate square meters of habitat
- Convert to acres
- Or create polygon to automatically calculate area

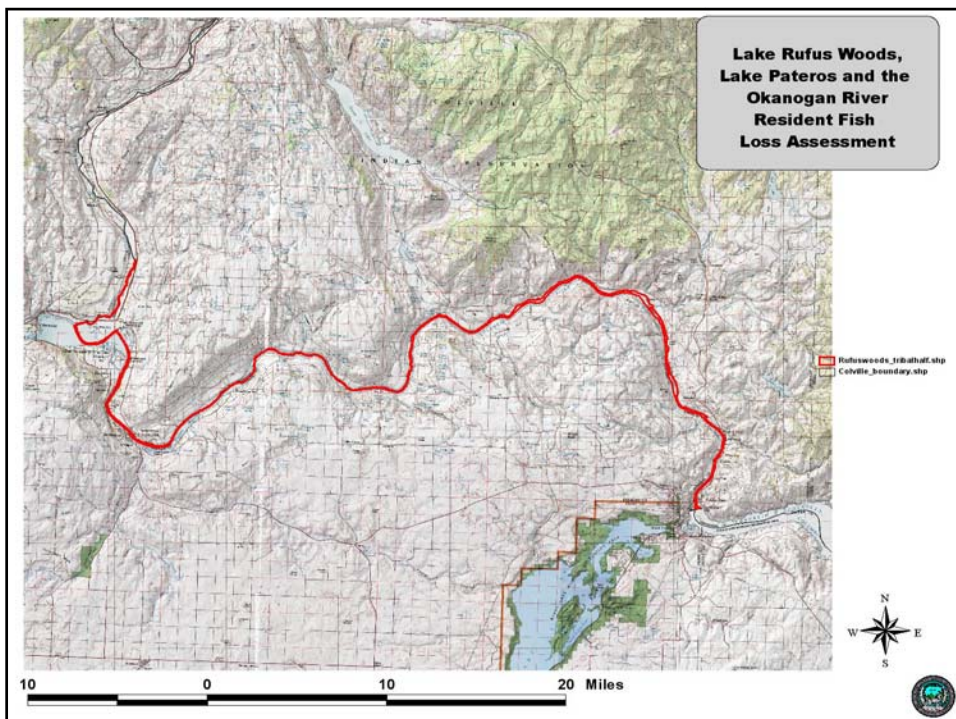
Process and Benefits

- Will acquire or digitize shape files of the original channel to calculate area and or length
- Work will be done at a scale of 1:12,000 or less
- Will determine stream order on 1 through 12 order streams then define by name or as mainstem
- Determine gradient
- Loss mitigation will be negotiated separately between each entity and BPA
- Can use to credit for acquisition or protection easements
- When unable to find similar habitat for acquisition especially on mainstem the process will provide for mitigation even when no similar habitat available



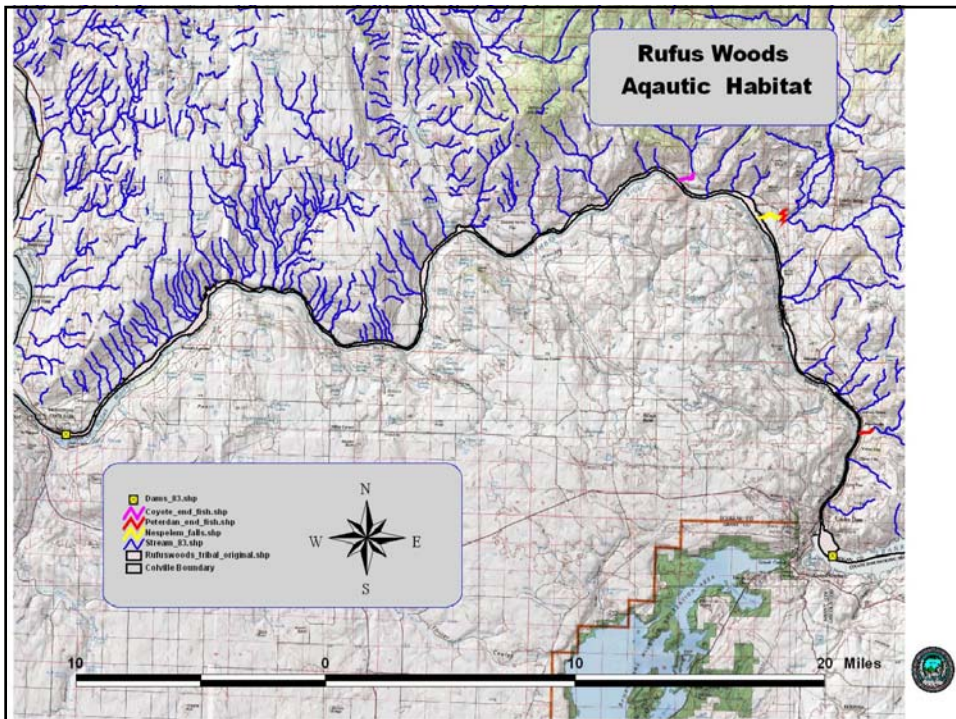
Calculating the Area or Length of Lost Habitat

- Select area to assess (Lake Rufus Woods)
- Create or locate GIS shapefile of original river and clip to Reservation boundary
- Clip to high water line of original river
- Loss will be defined in kilometers or acres of aquatic habitat




Determine Tributaries Impacted by Inundation

- Lake Rufus Woods has 4 tributaries that had historic use
 - Nespelem River
 - Peter Dan Creek
 - Coyote Creek
 - Tumwater Creek
- Many intermittent streams also provided habitat during the spring freshet



Colville Confederated Tribes Resident Fish Habitat Loss Assessment for Lake Rufus Woods and Tributaries					
Stream Name	Order	Reach #	Gradient (%)	Length (km)	Area (ac)
Rufus Woods	Columbia River Main Stem	1	1	83.19	2668.895
Nespelem River	5	1	4	8.96	1.433
Coyote Creek	5	1	7	5.67	0.742
Peter Dan Creek	5	1	4	4.17	0.545
Tumwater Creek	4	1	12	0.40	0.059



Stream Name	Order	Reach #	Gradient (%)	Length (km)	Area (ac)
Intermittent	2	1	1	0.26	0.030
Intermittent	3	1	7	0.20	0.030
Intermittent	1	1	4	0.23	0.033
Intermittent	1	1	3	0.06	0.009
Intermittent	3	1	2	0.79	0.114
Intermittent	1	1	4	0.05	0.004
Intermittent	1	1	2	0.08	0.007
Totals				127.1	2674.4



Calculating Area of Tributaries Without GIS

- Use of stream surveys to determine average width
- Determine length with surveys or map wheel
- Calculating the area

Nespelem River

Average width = 5.526 meters

Length of habitat = 121281 meters

$$w \times l = m^2$$

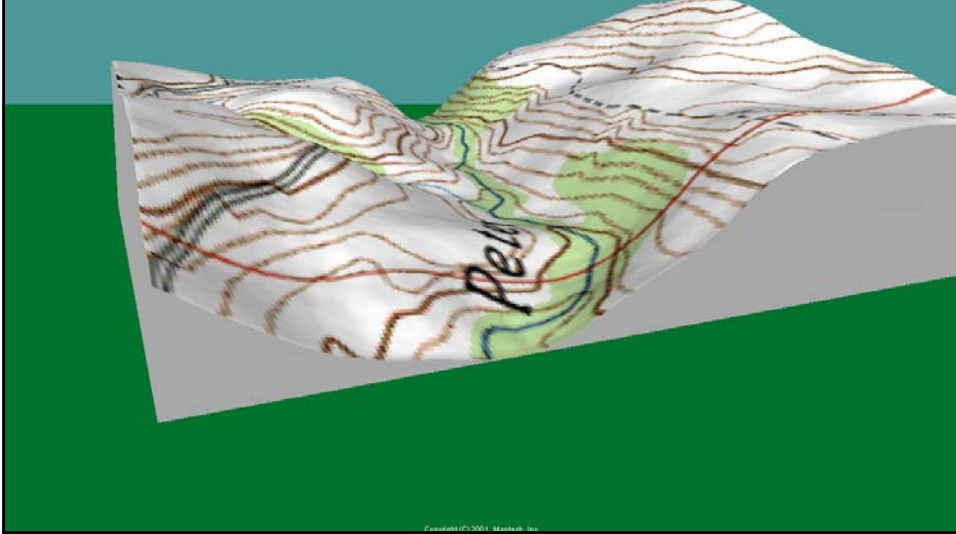
$$5.526 \times 121281 = 670,198.6 \text{ sq meters}$$

$$m^2 / 0.093 = ft^2$$

$$670,198.6 / 0.093 = 7,206,436 \text{ sq feet}$$

$$ft^2 / 43,560 = 165.437 \text{ acres}$$

Slope of stream 15%



Operational Losses Separated

- Methodology for the operational losses will be developed separately and presented at a later date.

