

# Skagit Delta Alternatives Analysis: Using Farm, Fish and Flood Indicators to Compare Project Concepts



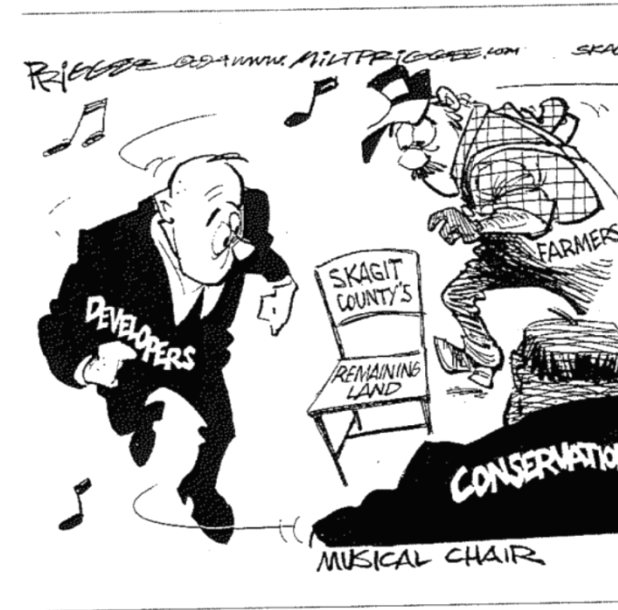
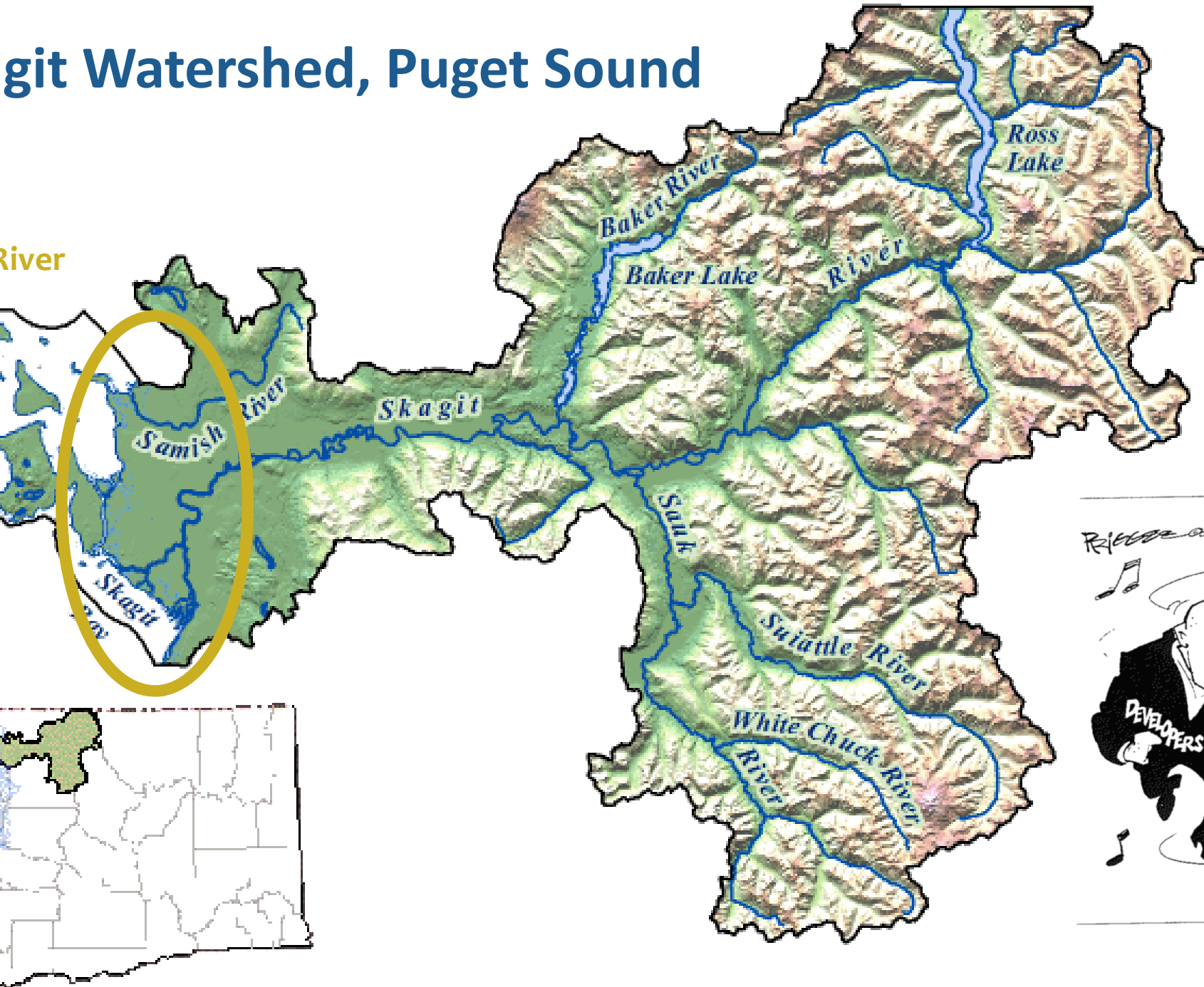
*Photo credit: Marlin Green*

RRNW Conference  
Feb 2018

Jenny Baker, The Nature Conservancy  
with co-leads Jenna Friebel, WDFW  
and Polly Hicks, NOAA

# Skagit Watershed, Puget Sound

River



# Community Needs:

Agricultural viability, salmon habitat, flood risk reduction



Photo by Marlin Greene Or



# Tidegate Fish Initiative

Links tidegate maintenance to estuary restoration for chinook recovery

## Fisher Slough

Multi-benefit project  
Estuary restoration, flood risk reduction,  
updated infrastructure, new relationships



## Farms, Fish and Flood Initiative (3FI)

*“create and advance **mutually beneficial strategies** that support the long-term viability of agriculture and salmon while reducing the risks of destructive floods”*

### Current Participants

IOAA	Western Wa. Agricultural Association
Kagit Co. Dike District Partnership	Wa. State Dept. of Agriculture
Kagitonians to Preserve Farmland	Wa. State Dept. Fish & Wildlife

# Hydrodynamic Model Project

Using an **alternatives analysis**, develop a suite of projects that are well-supported to achieve the long-term viability of Chinook salmon tidal delta habitat and community flood risk reduction in a manner that protects and enhances agriculture and drainage



Photo credit: Marlin Greene/O

Provides **transparency** about the **benefits and impacts**  
of estuary restoration concepts

# Project Working Group

DAA Restoration Center\*\*

Battle City Light

Skagit Conservation District

Skagit Co. Dike District #3

Skagit Co. Dike District #17/Dike District Partnership

Skagit Co. Dike & Drainage District #22

Skagitonians to Pres. Farmland

Skagit Watershed Council

The Nature Conservancy\*\*

Upper Skagit Tribe

US Geological Survey

WA Dept. of Fish and Wildlife\*\*

Western WA Agricultural Assoc.

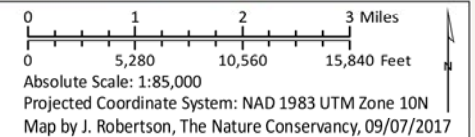
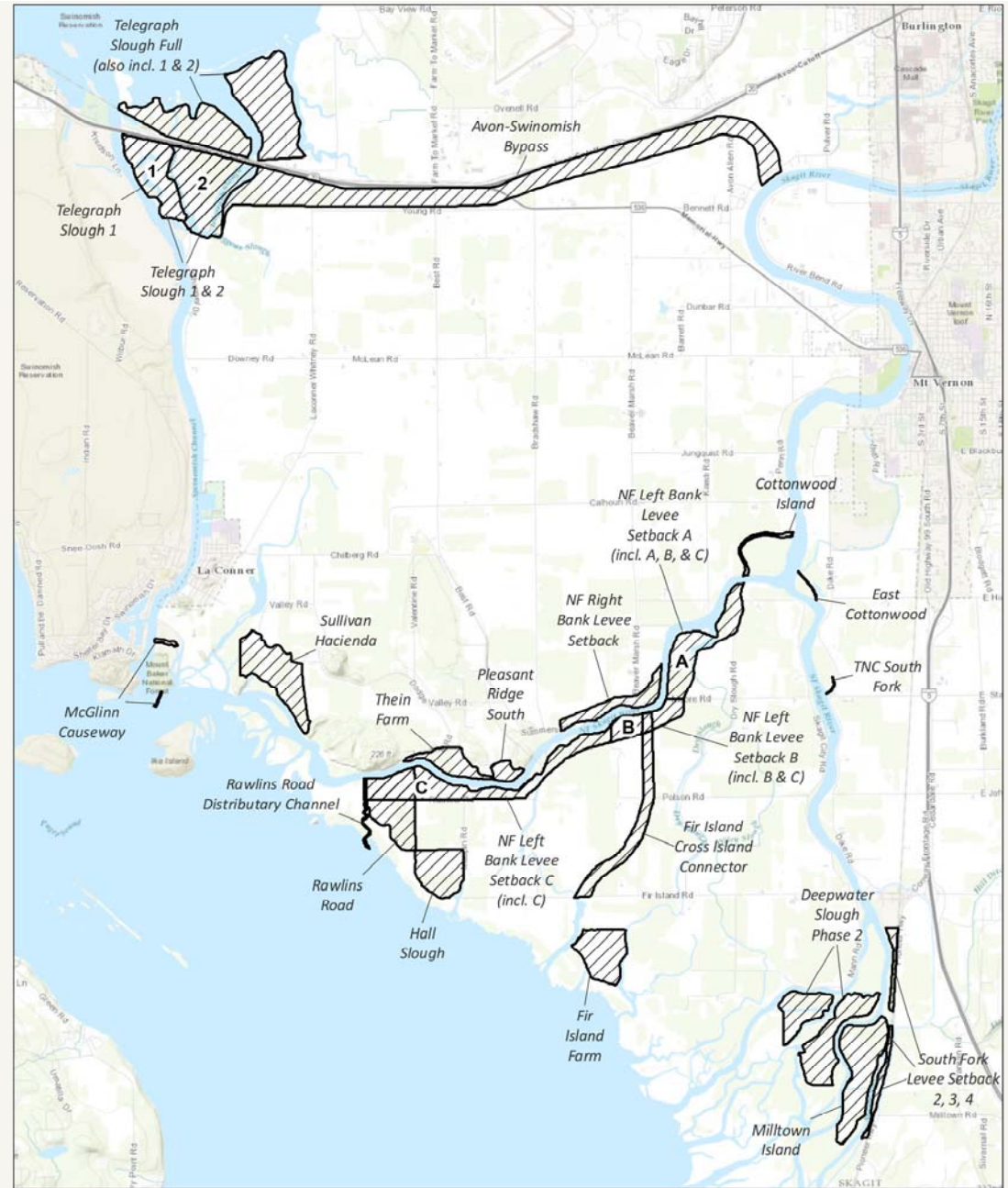
*co-leads*



Photo Credit: Jenna

# 23 Project Concepts

- *Chinook Recovery Plan*
- *Skagit Flood GI*
- *Concepts identified by local partners*





# Timeline & Process

Phase 1  
2012-2014

Phase 2  
2014 - 2017

Transparent and inclusive  
Seek understanding between interests  
Adapt to new input and ideas

## PHASE 1 (Previous report)

Convene SHDM Team

Define project goal

Develop objectives, indicators for each "F" and framework to assess projects

Identify project concepts and technical analyses needed

Community outreach

## PHASE 2

Refine project concepts

How to measure benefits to "F"s? Refine scopes of work for technical analyses

Complete technical analyses

Calculate indicators from technical outputs

NO

Assess Projects: Are indicators meaningful and do results make sense?

YES

Incorporate results into alternatives analysis

Refine framework to account for benefits and impacts

Review results and weight indicators within each "F"

Develop management recommendations for project groups

Combine and review results for all "F"s

# Best available science

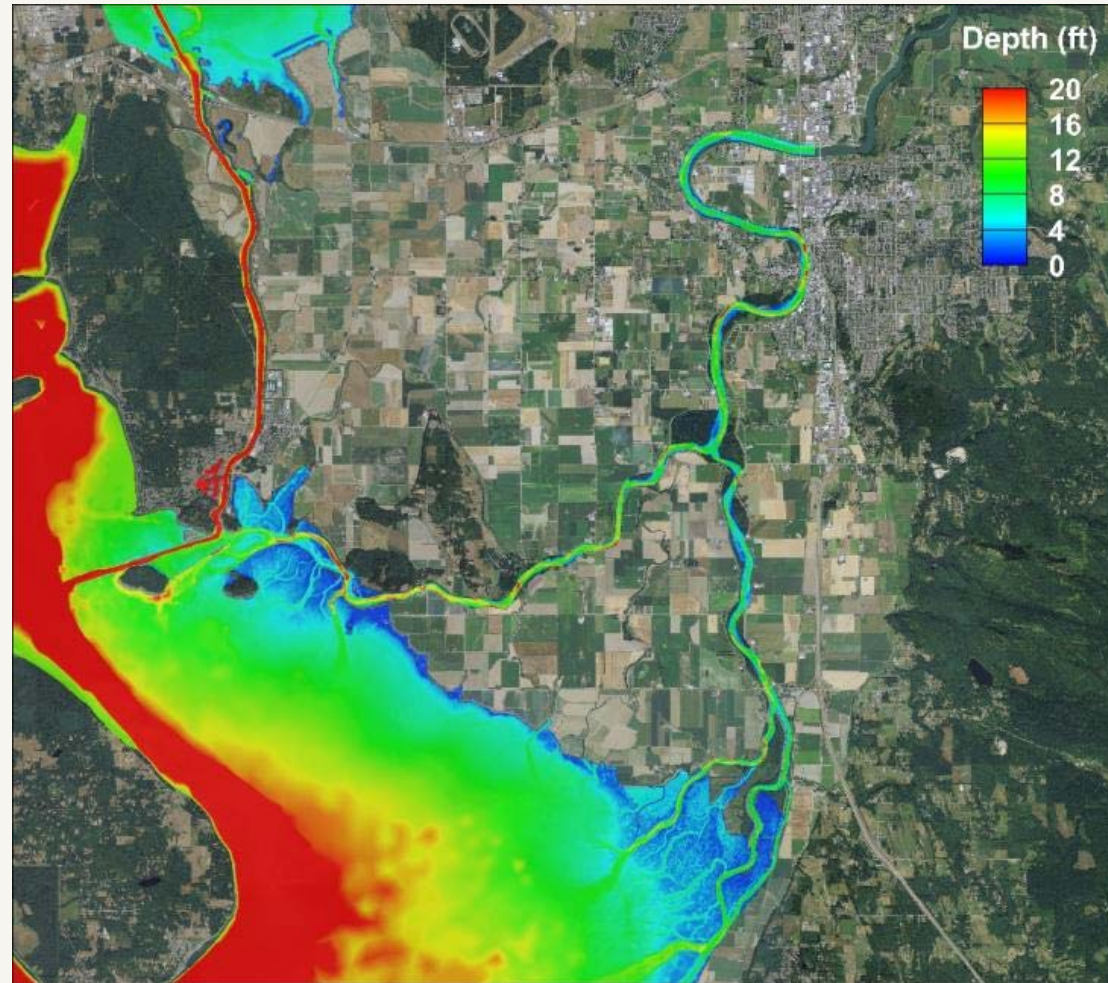


Used science to calculate indicators

- Updated channel development model (Greg Hood)
- Updated chinook smolt production estimates (Eric Beamer)
- GIS spatial analyses (Jamie Robertson)
- Updated vegetation prediction

# Best available science *(cont'd)*

Updated 3D hydrodynamic  
model (Batelle/PNNL)



- Area inundated to estimate potential habitat gains
- Depths and duration of inundation to quantify habitat quality and availability
- Changes in water surface elevation during a flood to evaluate flood benefits

# Primary Objective: Avoid Conversion of Protected Farmland Parcels

## Indicator:

Area within the restoration concept under existing farmland easement

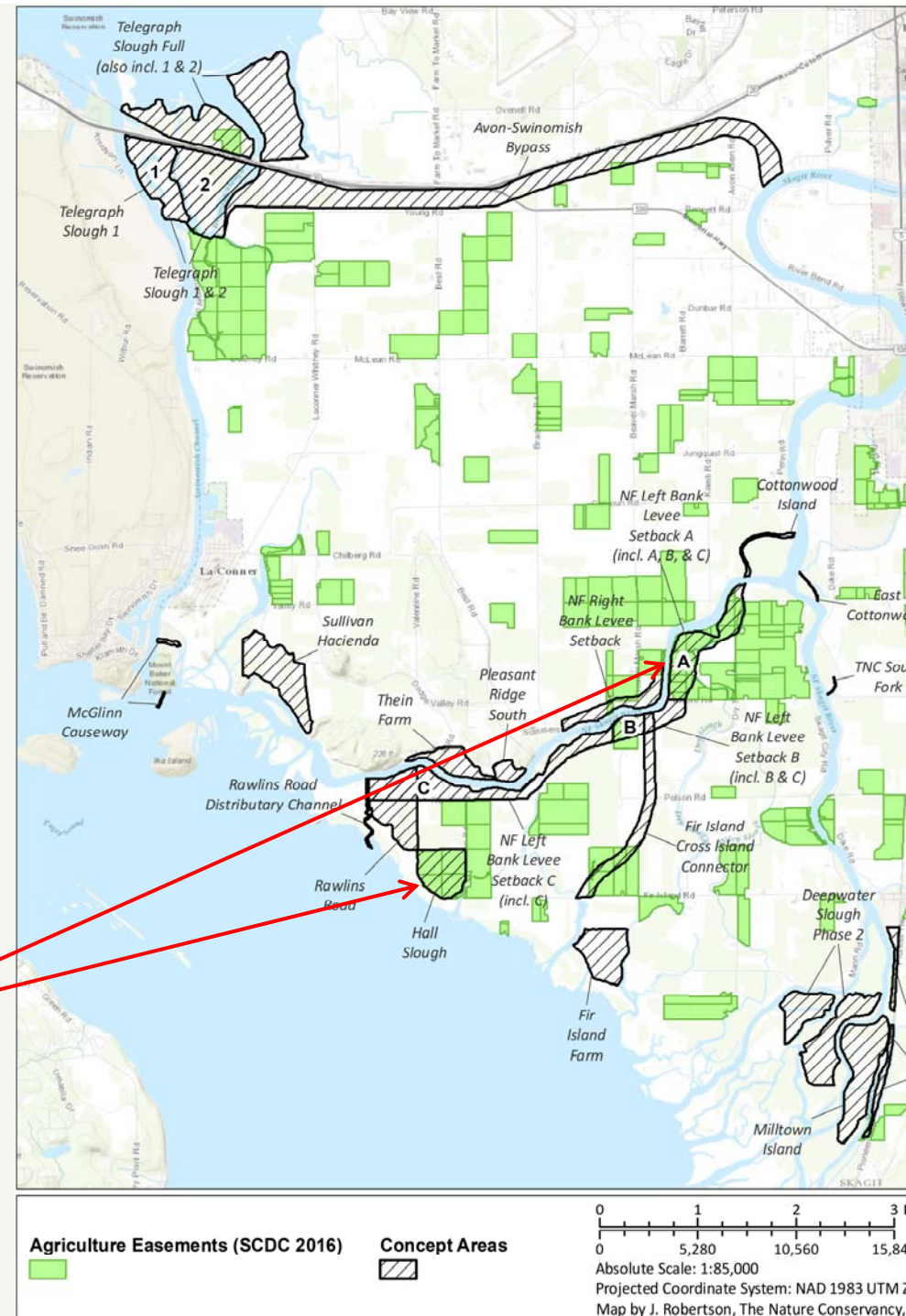
## Analysis Method:

Use GIS to overlay project concepts with existing farmland easement map to calculate area

Examples of locations where easements overlap with restoration project concepts

## Data Source:

Seaguit County Data Consortium Agricultural Easements (2016)

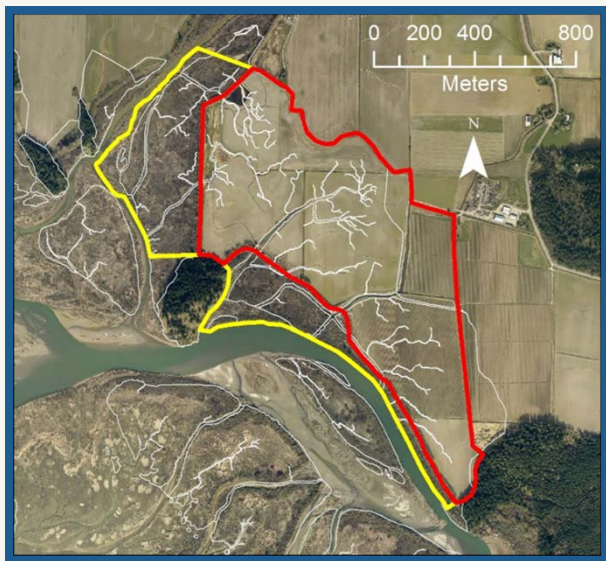


# Objective: Increase Channel Area Suitable To Chinook Rearing

**Indicator:** predictions of channel area

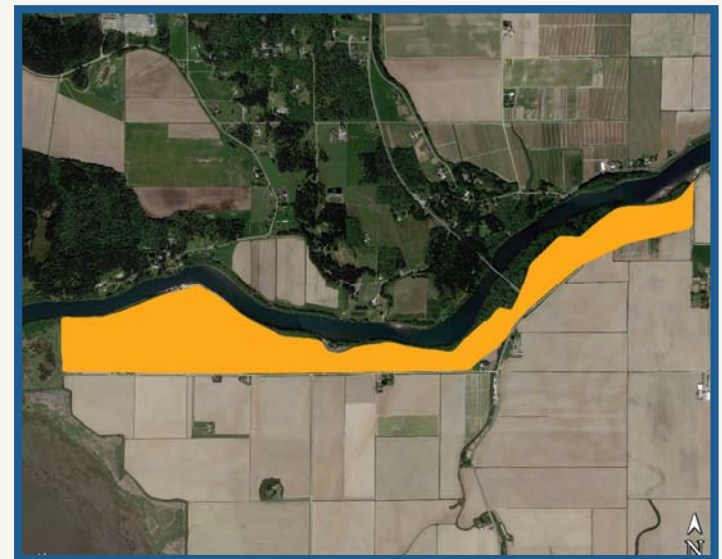
**Analysis Method:** Channel Allometry Model (G. Hood), which accounts for:

- *Off site area increases in channel area*
- *Influence of reduced tidal prism and wind/storm effects*
- *Inclusion of confidence intervals*



204.8 acres

34.7 (14 - 86.1) channel acres



274.9 acres

4.5 (1.5 - 13.6) channel acres

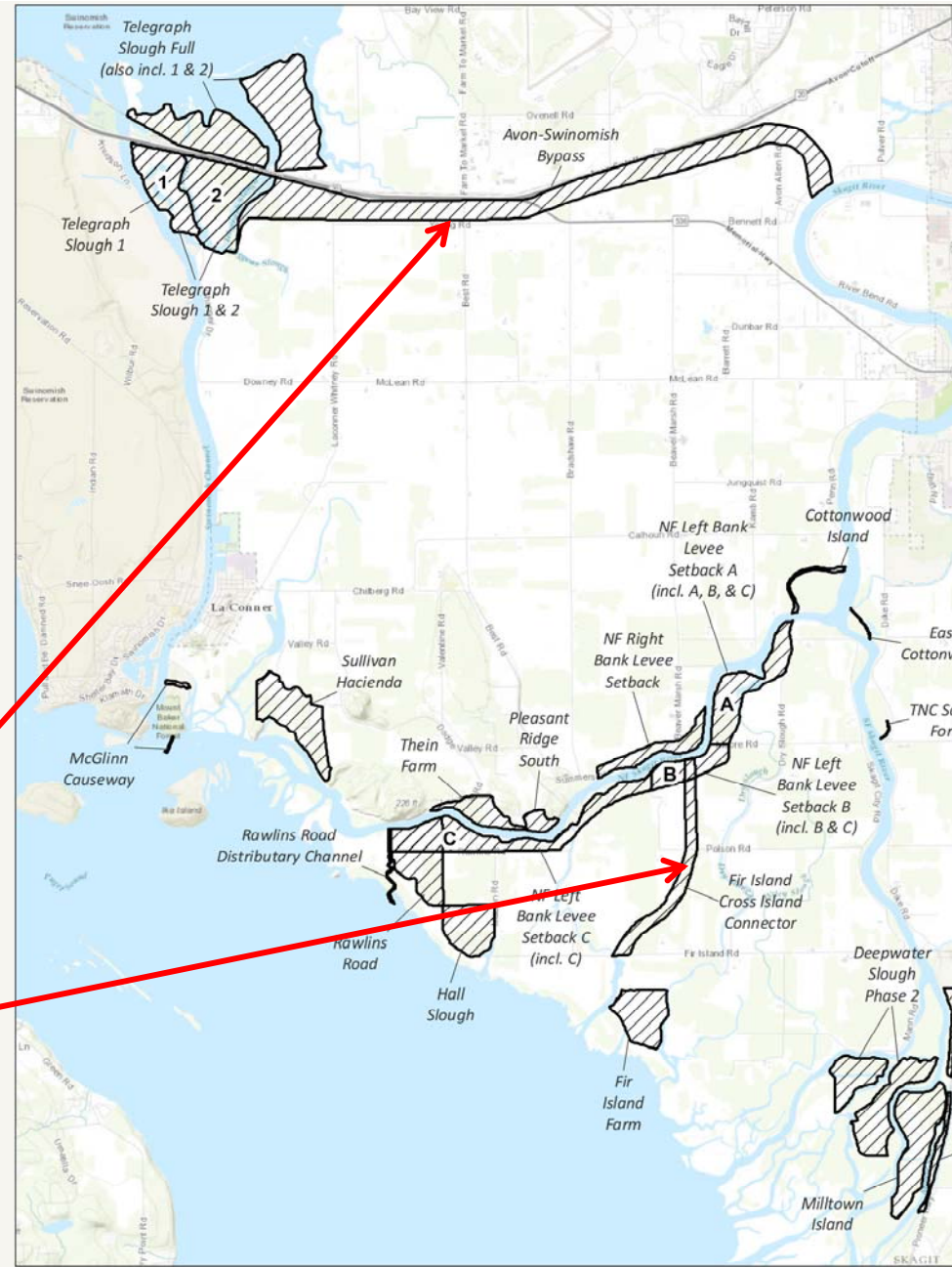
# Goal Objective: Avoid Creation of New Infrastructure Where None Currently Exists

Indicator:  
Length of new levee

Analysis Method:  
Calculate length of new levee where none existed before

Examples of projects that would add levees where none currently exist

Data Source:  
GIS measurement



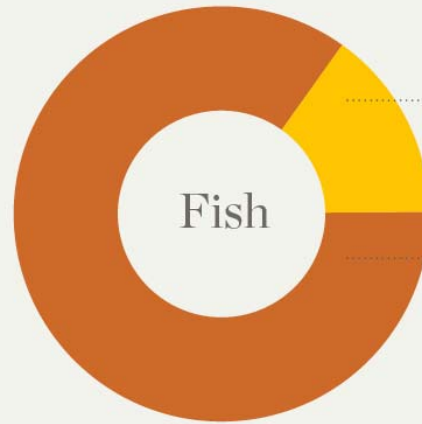
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0 5,280 10,560 15,840  
Absolute Scale: 1:85,000  
Projected Coordinate System: NAD 1983 UTM  
Map by J. Robertson, The Nature Conservancy

# Logic Framework



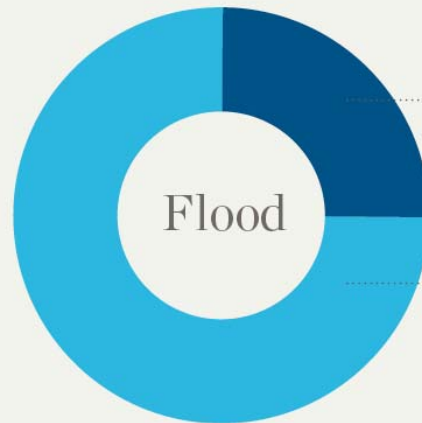
- **IMPACT - 40 PTS**
  - Minimize farmland loss
  - Avoid preserved farmland

- **BENEFIT - 60 PTS**
  - Maximize fish/acre farmland
  - Support regulatory agreements
  - Prioritize public lands



- **IMPACT - 15 PTS**
  - Minimize loss of existing habitat

- **BENEFIT - 85 PTS**
  - Restore tidal and riverine processes
  - Increase suitable channel habitat
  - Increase number of smolts
  - Increase connectivity
  - Restore diverse habitat types



- **IMPACT - 25 PTS**
  - Minimize new levees systems where none existed

- **BENEFIT - 75 PTS**
  - Reduce flood water elevations
  - Reduce risk of levee failure
  - Improve drainage



**TOTAL IMPACT SCORE - 80 PTS**

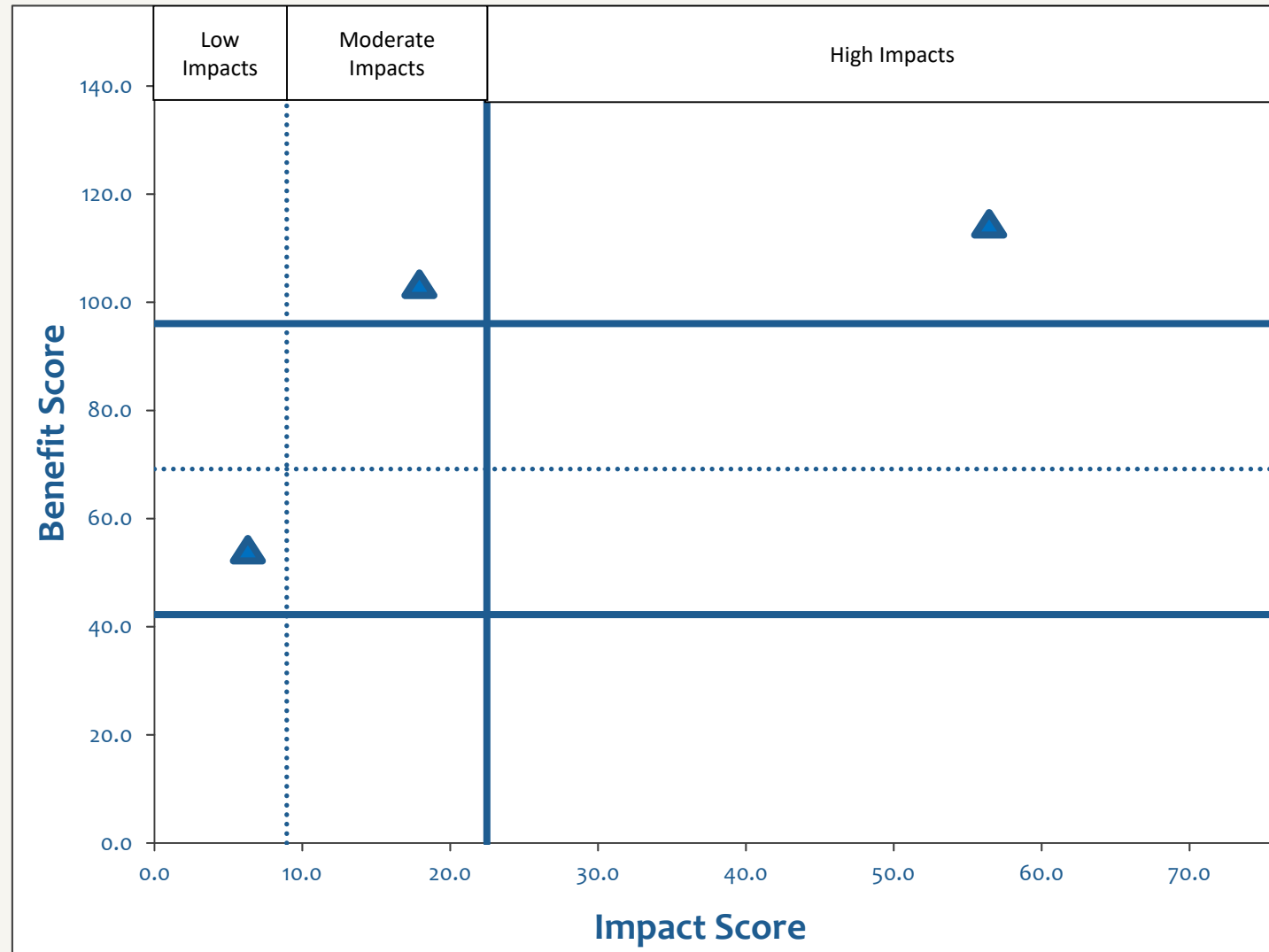
**TOTAL BENEFIT SCORE - 220 PTS**

# Total Multi-Interest Scores

Plotted total multi-interest benefit and impact scores

Identified distinct groups of projects

Developed management recommendations





## Partners

Dike District #17/Dike District Partnership  
NOAA Restoration Center  
Skagitonians to Preserve Farmland  
WA Dept. of Agriculture  
WA Dept. of Fish and Wildlife  
Western WA Agricultural Assoc.

## Project Work Group

Dike District #3  
Dike District #17/Dike District Partnership  
Dike & Drainage District #22  
NOAA Restoration Center  
Seattle City Light  
Skagit Conservation District  
Skagitonians to Preserve Farmland

Skagit Watershed Council  
The Nature Conservancy  
Upper Skagit Tribe  
US Geological Survey  
WA Dept. of Fish and Wildlife  
Western WA Agricultural Assoc.

## Technical Analyses

Pacific Northwest National Laboratory  
Skagit River System Cooperative  
The Nature Conservancy  
US Geological Survey

## Funding Organizations

EPA/National Estuary Program  
NOAA Restoration Center  
Private Donors  
SRFB/RCO/Skagit Watershed Council