Harrison, Bruce; Buffett, Dan; Petrie, Mark; and Christensen, Matthew, "Using a bioenergetic model to set waterfowl habitat objectives for the Fraser River delta" (2018). Salish Sea Ecosystem Conference. 92. https://cedar.wwu.edu/ssec/2018ssec/allsessions/92

This Event is brought to you for free and open access by the Conferences and Events at Western CEDAR. It has been accepted for inclusion in Salish Sea Ecosystem Conference by an authorized administrator of Western CEDAR. For more information, please contact westerncedar@wwu.edu.
Using a bioenergetics model to set waterfowl habitat objectives for the Fraser River Delta

Bruce Harrison          Ducks Unlimited Canada, Kamloops, British Columbia
Dan Buffett            Ducks Unlimited Canada, Surrey, British Columbia
Mark Petrie            Ducks Unlimited Inc., Vancouver, Washington
Matt Christensen       Ducks Unlimited Canada, Surrey, British Columbia
The 200,000 hectare Delta is the most-used migratory staging area in BC.

It supports the highest density of wintering waterfowl in Canada.

Mostly used by wintering and migrating waterfowl (33 species; 90 million waterfowl use days) and these birds use the FD mostly for food supply and refuge.
Agricultural Land Conversion

75% loss in historic marshes and flooded grasslands

Another 4000 ha lost by 2030

Tsawwassen Mills Mall ~404 ha

http://www.allpointbulletin.com/2015/11/20/tsawwassen-projects-will-be-...
Bioenergetic Modeling: TRU EM ET

Population Energy Demand
- Population Objectives
- Bird Energy Needs

Population Food Energy Supplies
- Habitat Acres
- Habitat Foraging Values

Foraging Habitat Deficit
Adequate Foraging Habitat
Foraging Habitat Surplus
## Inputs: Calculating Population Energy Demand

### Monthly Waterfowl Total - American Wigeon

<table>
<thead>
<tr>
<th>Species</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>36,867</td>
<td>106,650</td>
<td>131,667</td>
<td>101,383</td>
<td>130,350</td>
<td>67,150</td>
<td>79,000</td>
<td>17,117</td>
</tr>
<tr>
<td>Northern Pintail</td>
<td>3,366</td>
<td>270,605</td>
<td>159,657</td>
<td>97,418</td>
<td>56,827</td>
<td>62,239</td>
<td>5,412</td>
<td></td>
</tr>
<tr>
<td>Green-winged Teal</td>
<td>8,475</td>
<td>16,271</td>
<td>33,898</td>
<td>12,881</td>
<td>20,000</td>
<td>12,542</td>
<td>31,864</td>
<td>10,508</td>
</tr>
<tr>
<td>American Wigeon</td>
<td>19,117</td>
<td>288,311</td>
<td>193,169</td>
<td>138,389</td>
<td>100,909</td>
<td>74,961</td>
<td>11,532</td>
<td></td>
</tr>
<tr>
<td>Snow Goose</td>
<td>0</td>
<td>70,000</td>
<td>57,400</td>
<td>46,900</td>
<td>5,600</td>
<td>2,800</td>
<td>9,800</td>
<td>16,100</td>
</tr>
</tbody>
</table>

### Habitat Type

<table>
<thead>
<tr>
<th>Habitat Type</th>
<th>Main Food Source</th>
<th>Current Abundance (ha)</th>
<th>Available Energy (kcal x 10^6)</th>
<th>Use by Guild</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural</td>
<td>Harvested potatoes</td>
<td>1,440</td>
<td>4,470</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Harvested grains</td>
<td>684</td>
<td>720</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Green forage</td>
<td>2,982</td>
<td>9,586</td>
<td>✓</td>
</tr>
<tr>
<td>Wetland</td>
<td>Marsh seeds</td>
<td>162</td>
<td>51</td>
<td>✓</td>
</tr>
</tbody>
</table>

**Total**

|          | 5,268             | 14,827                |

**Abundance**

**Month of Observation**

**Inputs: Calculating Population Energy Demand**

**Demand**

- **Dabblers**
- **Grazers**
Inputs: Calculating Population Energy Supply

Forecast of Waterfowl Compatible Agricultural Crops in the Corporation Delta (2015-2040) Based on Historical Trend Data (%/year)

- Waterfowl Non- Compatible
- Waterfowl Compatible

Actual | Forecast

Area (ha)

Results

Forecast for 2020 and 2030 without intervention

[Graph showing energy supply and demand for Grazers and Dabblers for the years 2009, 2020, and 2030, with time periods from September to April.]
Explanation for dabbler results:

Likely a combination of high population objectives and missed ‘natural’ food sources.

We have a good ability to measure managed habitats, but measuring natural ones is more challenging.

Also, the Fraser Delta is not a ‘closed system’ – waterfowl may move up and down into Puget Sound dependent on weather and food supply.
Setting Habitat Objectives

Approach = provide sufficient energy supply to meet 50% of the needs of dabbling and grazing waterfowl on agricultural lands.

This equates to $15,000 \times 10^6$ kcal of energy.

Without intervention, by 2030 there will only be $7,600 \times 10^6$ kcal.

### What do we need?

<table>
<thead>
<tr>
<th>Habitat Type</th>
<th>Main Food Source</th>
<th>Predicted scenario without intervention</th>
<th>Target scenario</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2030 Abundance (ha)</td>
<td>Available Energy (kcal x $10^6$)</td>
<td>2030 Abundance (ha)</td>
</tr>
<tr>
<td>Agricultural</td>
<td>Harvested potatoes</td>
<td>732</td>
<td>2,271</td>
</tr>
<tr>
<td></td>
<td>Harvested grains</td>
<td>344</td>
<td>362</td>
</tr>
<tr>
<td></td>
<td>Standing grain</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Green forage</td>
<td>1,538</td>
<td>4,944</td>
</tr>
<tr>
<td>Wetland</td>
<td>Marsh seeds</td>
<td>162</td>
<td>51</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>2,776</td>
<td>7,628</td>
</tr>
</tbody>
</table>

### How do we get to there?

- Acquire 200 hectares
- Intensively farm all ‘controlled lands’ in equal amounts of potatoes, standing grain and green forage
- Keep 800 hectares in green forage via easements/industry influence
- Encourage compatible cropping on 2,000 hectares via stewardship.
Next steps

• Collect better information on natural food sources (e.g. wetland/marsh foods, seeds, invertebrates) and migrant numbers
• Improve our understanding of the energetic needs of seaducks and brant
• Continue to monitor and measure habitat change, particularly on agricultural lands and intertidal areas (sea level rise)
Thank-you

Matt Christensen | M_Christensen@ducks.ca
Bruce Harrison | B_Harrison@ducks.ca
Dan Buffett | D_Buffett@ducks.ca
Mark Petrie | MPetrie@ducks.org

BC Waterfowl Society

Science Horizons Youth Internship Program

Delta Farmers