

## <u>INMS Component 3</u>: Developing regional assessments of nitrogen management



Nooksack-Fraser Transboundary N Project (NFT-N)

North America Demonstration

Jana Compton, Dave Hooper, Shabtai Bittman, Jill Baron

**INMS-5** Meeting



### Outline

- 1. Context of the region, including known N threats & benefits
- 2. Nitrogen budget: Analysis of sources and fates, by sector
- 3. Regional performance indicators
- 4. Options for, progress in and barriers to better nitrogen management
- 5. Future tasks and directions
- 6. INA Chapter



- US & Canada watershed, air-shed and aquifer, drains to Puget Sound and Salish Sea
- Variety of land use Cities, farms, dairies, poultry, shellfish operations
- Policy differences between Canada and US
- Tribal/First Nation treaty rights Nooksack is place name meaning "always bracken fern roots"
- Smallest demo site (Mt. Baker to Puget Sound) but microcosm of many major issues of "Case 4": Developed economies, excess Nr
- "Downstream" effects are local air quality (Fraser Valley), groundwater (A-S aquifer), coastal eutrophication (Bellingham Bay)

### Nooksack-Fraser Transboundary Nitrogen study (NFT-N)

### **Project Goals**

- Brought together diverse stakeholder team monthly meetings since 2017
- Voluntary, leveraged effort INMS umbrella but not funding
- Published N budget Share/vet data among stakeholder team
- Identify and evaluate solutions to meet community goals
  - $\ensuremath{\circ}$  Improve air and water quality
  - Sustain agriculture, aquaculture and other community interests
  - $\odot$  Economic goals



## **2. Nitrogen budget: Analysis of sources and fates, by sector** (Tasks 3.1.1 - 3.1.3)



Method – *Inventory approach for inputs and outputs, data driven, bottom-up crop and animal N estimates* 

Year of focus – 2014

Inputs, outputs, fluxes – *Thorough inventory of inputs and outputs (from agriculture to salmon)* 



Jiajia Lin et al. (In press JGR Biogeosciences)

### **3. Regional performance indicators**

Nitrogen Use Efficiency analyses for key systems

	US-NRW	Canada-NRW	Whole NRW
Crop NUE (Total Manure and Fertilizer) Includes 35% N loss (volatile) before appl.	54%	22%	51%
Crop NUE (Applied Manure and Fertilizer)	71%	31%	67%
Farm-Gate NUE (crop + animal N)/all Ni	19%	45%	27%
Commercial Whole-Farm NUE (crop + animal N)/(manure + fert N)	24%	53%	33%

Jiajia Lin et al. (In press JGR Biogeosciences)

### Other indicators related to regional priorities

- Groundwater nitrate and trends
- Nitrogen contribution to Puget Sound hypoxia
- Air quality and loads by source
- N surplus metrics, legacy metrics





#### Vancouver, BC, Canada







# 4. Options for, progress in and barriers to better nitrogen management (T 3.1.7, 3.1.8)

- Highlights of promising actions
  - Tracking groundwater quality improvement trends
  - Manure transport via pipes in US
  - Guidance for manure application risk management
  - Manure spreading advisory app <a href="https://www.wadairyplan.org/ARM">https://www.wadairyplan.org/ARM</a>
- Use of "less expensive" nitrate sensors to inform science and management
  - Leveraging USGS real-time network
  - Combining with nitrate and water isotopes to track sources and processing



### 5. Future tasks and directions

- Solicit input from organizations about N management
  - Tasks 3.1.4, 3.1.5; Barriers to Change, A1.6
- Compile and share effective N management actions
  - How can we link to A2.3 (N Measures Database), A2.4 (N Policies)?
- Connect to scenario modeling for Puget Sound hypoxia and nutrient source reduction (WA Dept. of Ecology)
  - Wastewater treatment (60% of inputs to Puget Sound)
  - Address other diffuse sources (reductions) what is realistic?



### **INA Book chapter**

### Geographic scope

- All of North America: Canada, US, and possibly Mexico
- Build on existing input inventory and case examples.

### Case study within the chapter

- Lessons from the Nooksack-Fraser demonstration
- Including measures of success, barriers to change, comparisons of international transboundary management approaches, possible paths toward sustainability.