

A Land-Based and Spatial Assessment of Local Food Capacity in Northern Idaho, USA

Dr. Felix Liao

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Outline

- Background
- Study Area
- Data and method
- Results
- Conclusions



Background

- Local food definition
 - Food sold directly by farms to consumers
- Benefits of local food
 - Small farm income
 - Food security
 - Sustainable community
- Mapping foodshed

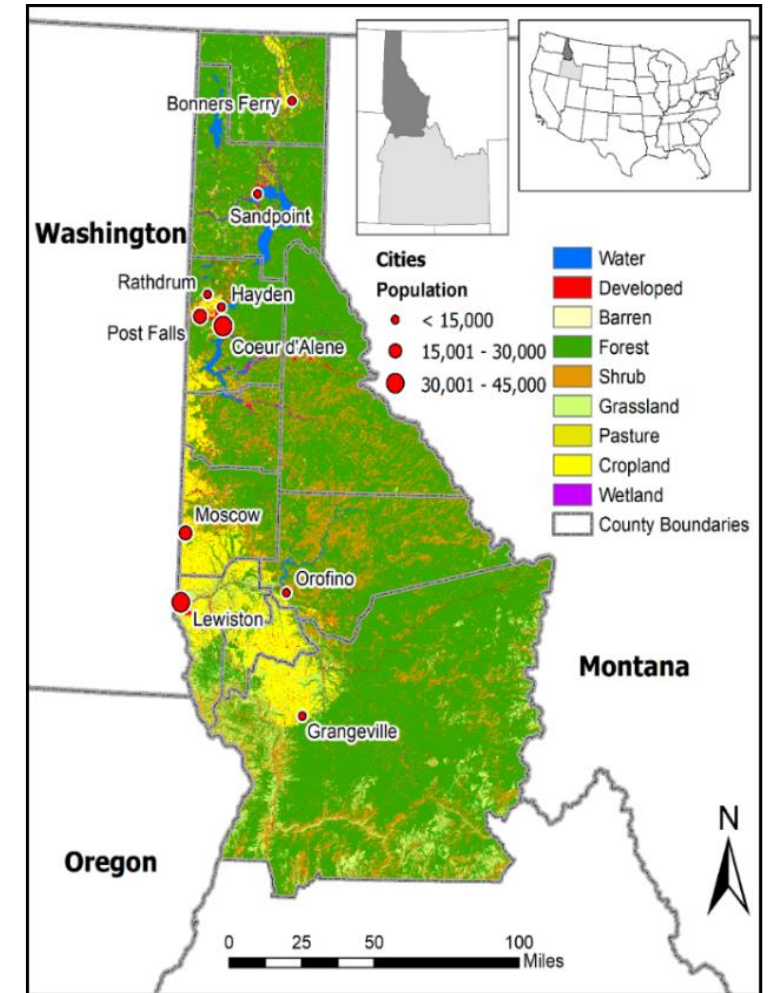


(Time Magazine,
Mar 12th, 2007)

GIS day

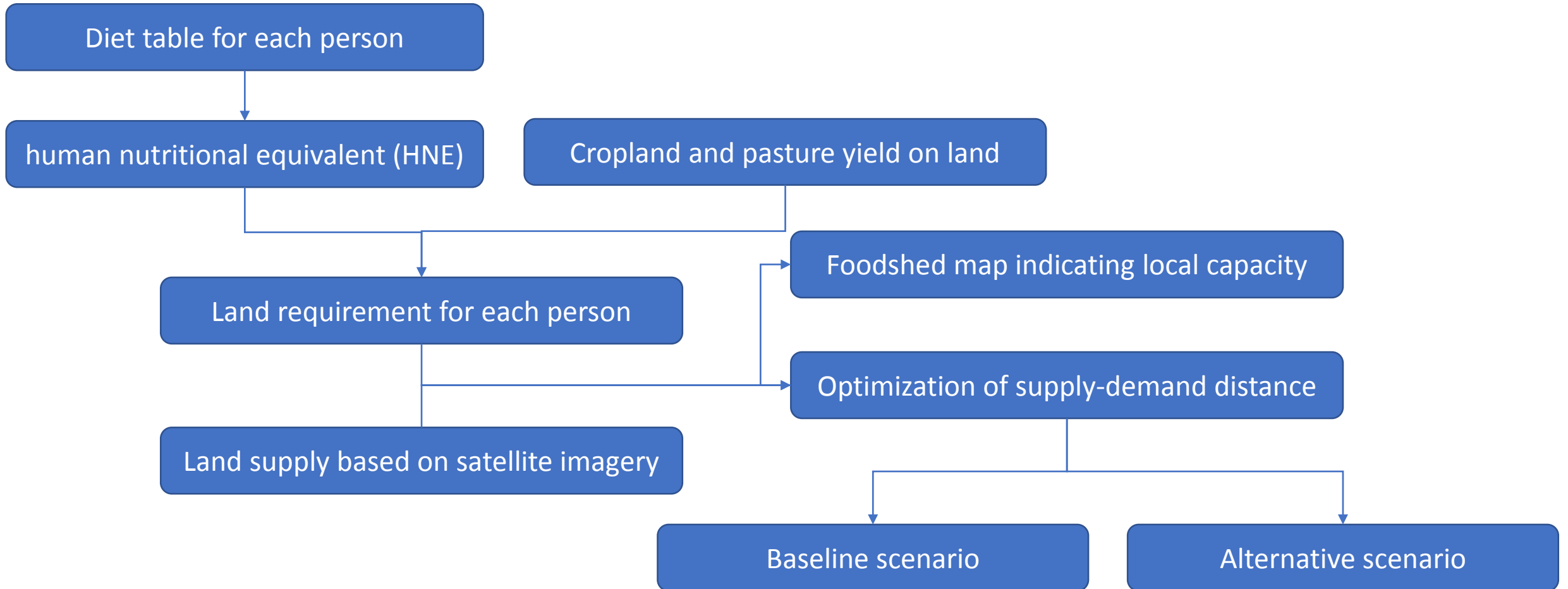
Study area

- Northern Idaho/Idaho Panhandle
 - Fast-growing college and resort towns
 - Strong momentum in local food movements
 - Ecological issues like soil erosion



Data and methods

- Methodological framework



Data and methods

- Qualitative data
 - Web-base survey of local retail grocery stores and restaurants
- Quantitative data
 - Diet table from USDA
 - Human nutritional equivalent (HNE)
 - Crop yield data
 - NLCD land use data
 - Census 2010

Table 2. Representative crops used to determine production capacity

Vegetables	Fruits	Meat, Dairy, Eggs	Grains/Field Crops/Others
Asparagus	Apples	Beef	Wheat
Carrots	Blackberries	Pork	Barley
Cucumbers	Blueberries	Chicken	Corn for grain
Dry beans	Cherries	Chicken eggs	Oats
Dry peas &/or lentils	Grapes	Cow milk	Forage
Garlic	Peaches	Cheese	Sugar beets
Green beans	Strawberries		Canola oil
Greens bunched			Sunflower seeds
Greens, salad			Nuts
Lettuce, head			
Onions			
Peas, green			
Peppers			
Potatoes			
Squash, summer			
Sweet corn			
Tomatoes			



Sources: Idaho preferred <https://idahopreferred.com/>, buyer survey, and experts' inputs

Data and methods

- Linear programming

- Maximizing food capacity while minimizing supply-demand distance

Minimize

$$\sum_{i=1}^S \sum_{j=1}^D C_{ij} x_{ij}$$

$$\sum_{k=0}^n x^k a^{n-k} \quad (1)$$

Subject to

$$\sum_{i=1}^s x_{ij} \geq d_j \quad (2)$$

$$\sum_{i=0}^n x_{ij} \leq s_i \quad (3)$$

$$x_{ij} \geq 0 \quad (4)$$



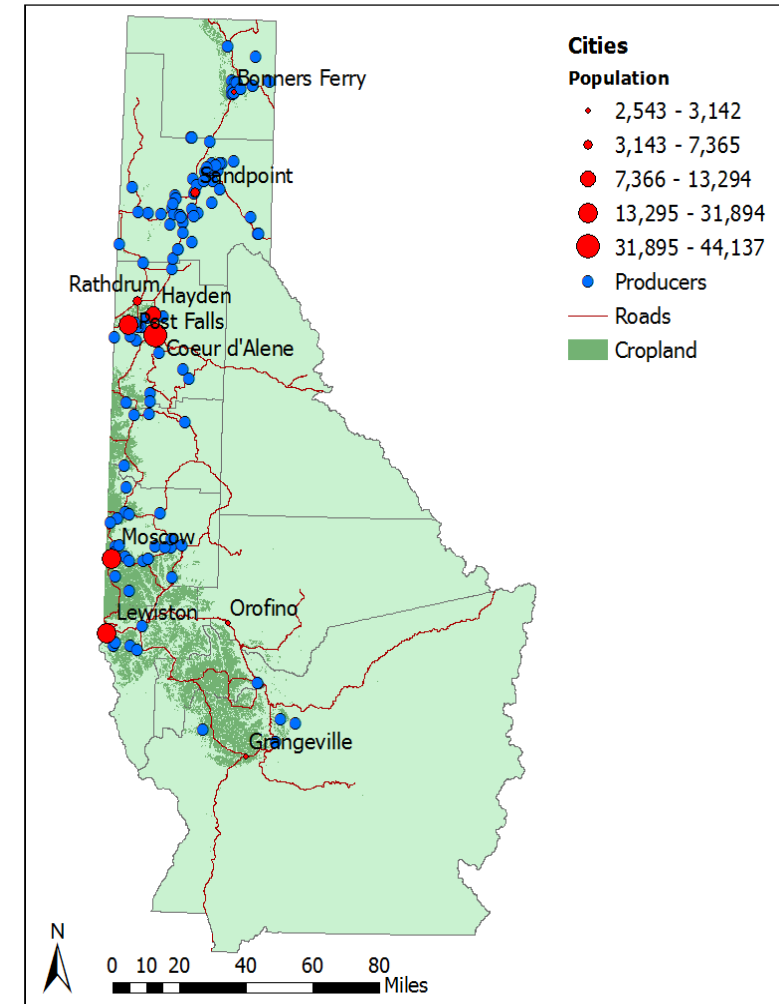
Where $C = \{C_{ij}\}$ is the distance between the production zone (i) and the demand point (j), $X = \{x_{ij}\}$ is the supply (i) to demand (j), $\{d_j\}$ is the need for the region, $\{s_i\}$ is land availability and expected yields of each crop.

Results

- Supply and demand of local food
 - Producers close to resort towns
 - A growing demand for local food in NI region

Table 3. Northern Idaho grocery and restaurant buyer survey results. N=40

Product	does NOT source this product, but is interested in sourcing it locally	sources this product locally	sources this product, but is NOT interested in sourcing it locally	does NOT source this product, and is NOT interested in sourcing it locally
Vegetables	49.33%	26.81%	3.26%	20.59%
Small Plant Fruits	38.71%	34.10%	6.45%	20.74%
Tree Fruits	47.18%	26.06%	2.82%	23.94%
Dairy, Meat, & Eggs	32.06%	33.10%	5.57%	29.27%
Field Crops/Grains	21.30%	28.40%	2.96%	47.34%



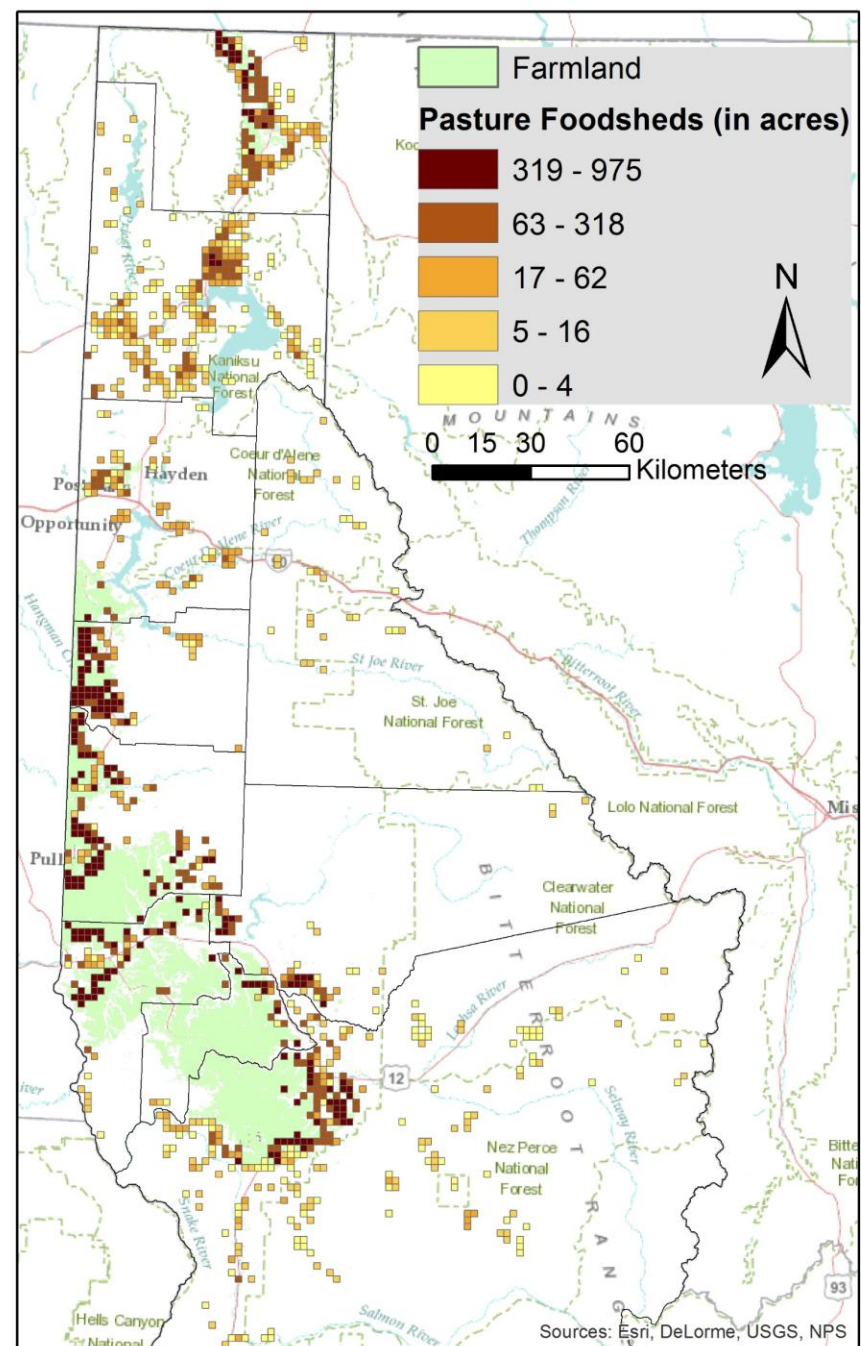
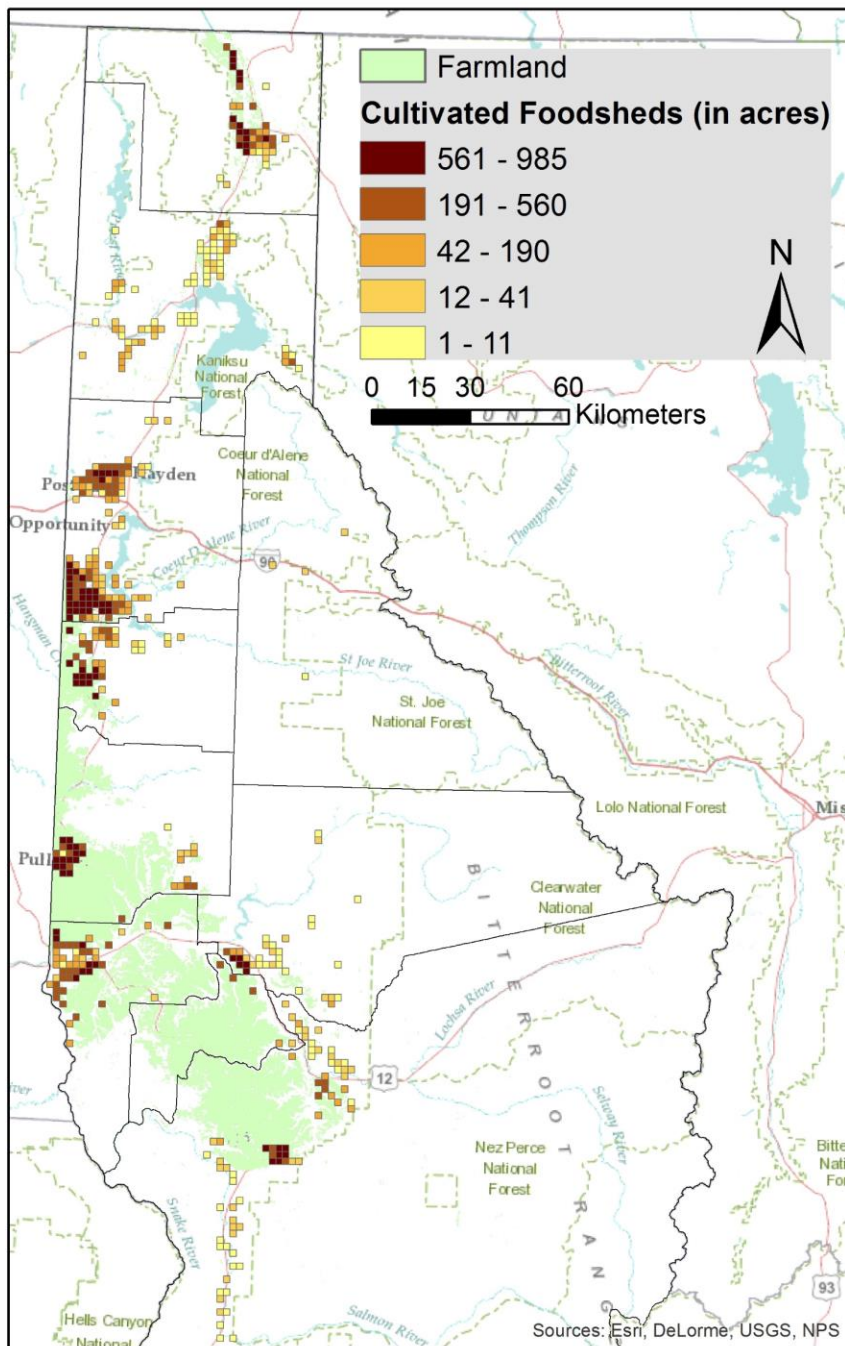
Results

- Land requirement and supply
 - Abundant in cultivate croplands but short in pasture
- Foodshed map
 - Local food production is potential for areas close to growing resorts
 - Arable land is available for areas close to small towns

Table 5. Demand of agricultural land and the land available to meet this demand for cultivated foodsheds (HNEa) and pasture foodsheds (HNEp).

Food category	Land requirements (ha)	Land supply (ha)	Production potential (Mg)
<u>HNEa</u>	48,577	369,952	4,777,631
<u>HNEp</u>	71,442	6,104	20,832
<u>HNEt</u>	120,020	376,057	4,798,462

Source: Agricultural census, 2012; NASS, quick statistics; ID agricultural bulletin



Results

- Optimization of local food capacity
 - Northern cities have the longest food distances to meet demand
 - Alternative scenario trades the less productive, highly erodible land for longer distance

Table 6. Food distance travelled by population centers (in the unit of km).

Population center(s)	Total		Cultivated Foodshed		Pasture Foodshed	
	Baseline	Alternative	Baseline	Alternative	Baseline	Alternative
Coeur d'Alene	90.31	118.43	51.46	50.63	116.72	164.52
Post Falls	82.70	152.06	29.52	29.35	118.86	235.48
Lewiston	7.43	25.32	6.26	6.44	8.22	38.16
Moscow	6.23	48.49	4.07	4.07	7.69	78.69
Sandpoint	56.12	128.76	64.32	65.70	50.54	171.64
All zones	49.29	90.43	29.91	29.79	62.47	131.66

Conclusions

- The demand for local vegetables and fruits is high for local retail grocery stores and restaurants
- The existing local food producers are located in the urban fringe and on productive cropland
- The local food could sustain the population in NI with an average travel distance of 30.44 miles
- In spite of longer travel distance, ecological benefits can be derived from conserving highly erodible cropland



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Thank you!

Questions or comments?

Dr. Felix Liao (hliao@uidaho.edu)

