# *Economic Self-Determination and Commercialization of Subsistence Marine Resources of Alaska Natives*

*8th Meeting of the UN Open-ended Informal Consultative Process on Oceans and the Law of the Sea*

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## Alaska Marine and Forest Products

- Modern utilization for commercial purposes based principally on the enduring wisdom of Alaska Natives
  - Subsistence foods and traditional medicines
- In local industries these products typically marketed as:
  - Specialty wild food/menu items, jams/jellies, and confections
  - Teas and health-oriented beverage ingredients
  - Hand-crafted medicinals and tonics
  - Boutique cosmetics and personal care products
  - Home environment enhancing products
- Beyond established commercial fisheries, new opportunity must derive from ***sustainable*** resources and supply chains for emerging large, high-value markets

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# Denali's Vision

- Develop Alaska's exceptional wilderness and marine bioresources for high-quality:
  - Nutraceuticals
  - Cosmeceuticals
  - Phytopharmaceuticals (Herbals)
  - Pharmaceuticals
- Promote bioresources with plentiful *bona fide* "bioactives" for improving health and quality of life
- Create sustainable economic development from renewable resources, notably in underdeveloped rural areas, through environmentally-friendly processes

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# Nutraceutical Industry Statistics

- Tremendous untapped opportunities exist for in large markets
- Revenues from nutraceuticals
  - >$75BB by 2007 in U.S.
  - >$210BB globally, growing to >$310BB by 2010
  - Adjusted annual growth rate of:
    - +9% for botanicals
    - +18% for fortified beverages
    - +22% for natural foods
    - +27% for functional food
- Compare to ~$55 BB annual research commitment by major U.S. pharmaceutical companies

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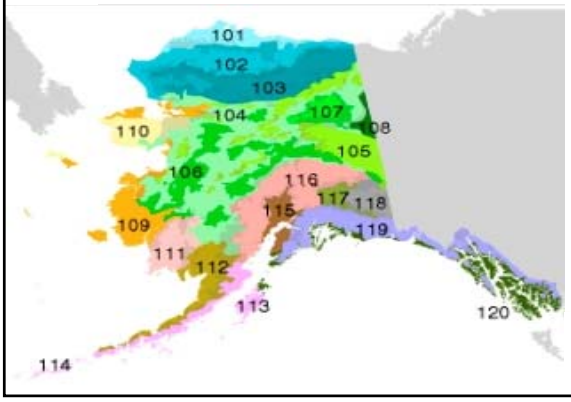
# Biodiversity Sources of Alaska

- Inherent biodiversity in 20 USGS ecoregions
  - 6+ climatic zones (12 with maritime features)
  - Every major geologic period represented
  - Pre-ice age, unglaciated tracts; 10,000 extant glaciers
  - 89 volcanoes with hotsprings and boiling mudpots




- Enormous metal and mineral deposits
- 2 old-growth rainforest stands (33 MM acres)
- 5 tundra types and bogs
- Sea level to 20,300 feet
- 33,000 miles of coastline

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# Alaska's Unique Environment

- Vast Alaska wilderness and marine environments provide rich sources of novel commercial products
- Result from extreme environmental stresses
  - Unusual species and novel molecules emerge through biochemical/genetic adaptation to harsh conditions
- Biotic
  - Herbivory (mammals, birds, insects), microbial pathogens
- Abiotic
  - Photoperiod length / UV exposure (60 days to 200 days)
  - Nutrient-poor soils, high levels of metals (e.g. arsenic)
  - Precipitation (150mm to 2500mm; 6 in. to 150 in.)
  - Temperature (-63°C to 35°C; -82°F to 95°F)
    - **Most organisms are psychrophilic or cold-adapted**

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# Discovery Strategies

- Random Bioprospecting
  - Small quantities of soils, sediments, coastline samples
    - Cultivable microbes and nucleic acid recovery from uncultivable organisms that yield enzymes/biocatalysts
    - Exclusively for pharmaceutical discovery
- Targeted Bioprospecting
  - Focused collections of small amounts of plants, soils, sediments, etc. directed by chemotaxonomy, chemical ecology (abiotic/biotic stress), extreme conditions
    - Principally for pharmaceutical discovery or cosmeceuticals
- Ethnopharmacology
  - Alaska Native traditional medicine and subsistence diets offer hundreds of plant, fungal, animal, and marine candidates for product R&D

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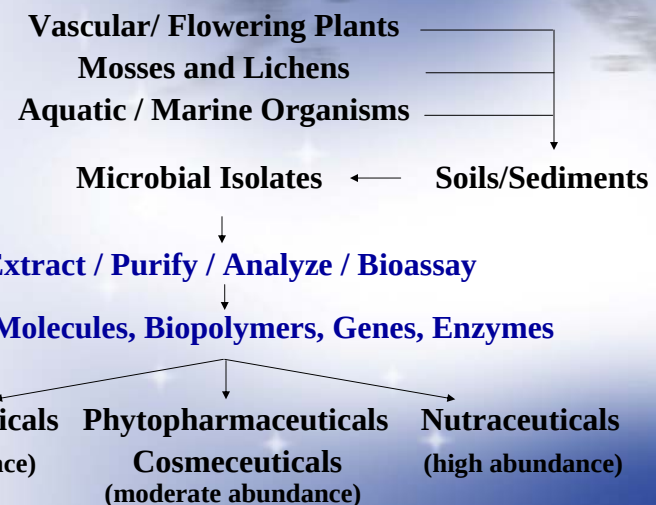
# Maximum Fieldwork Output

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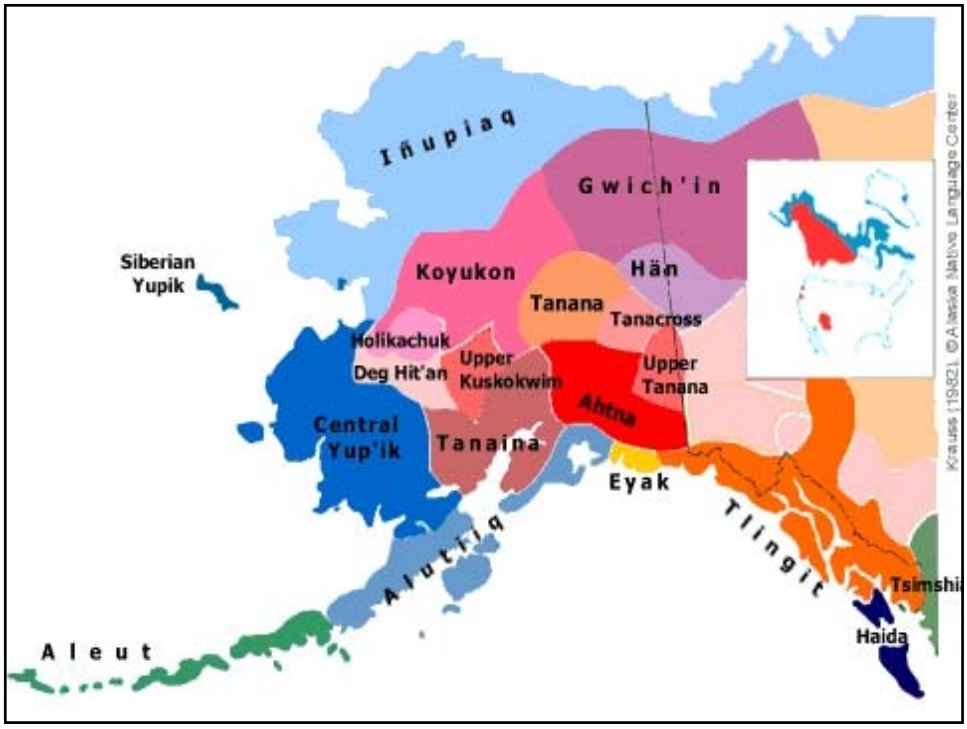

# Alaska Native Claims Settlement Act

- Alaska Natives extinguished sovereign rights to land and resources for $962.5 million in 1971
- ANCSA prevented formation of reservations after Alaska statehood was granted in 1959
  - One reservation formed voluntarily (Metlakatla) and one tribal government / reserve (Venetie)
- ~10% of Alaska land belongs to ANCSA entities
  - 13 Regional Corporations – subsurface rights
  - 200+ Village Corporations – surface / coastal access rights
  - Tribal councils advise on cultural issues; no economic status
  - Contrast to ~65% Federal, ~25% State, <1% private lands
- Intended to provide for economic self-determination

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# Bioprospecting Model

- Research and commercial development activities require access for bioprospecting of marine resources and non-timber forest products
- Legal considerations involving ownership and compensation to government or landholder
  - Collaborating landholders are primarily Alaska Native corporations / tribal councils
  - Federal and State landholders governed by law
- Denali (and predecessor companies) crafted the pioneering “Biodiversity Access Agreement” for Alaska – self-imposed code of ethics
  - Based on common sense and “Golden Rule”

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# “ Fair Treatment ” Agreement

- Denali’s version of the “Fair Trade” Agreement
  - New initiative introduced for consideration in May, 2007
  - Targeted to accommodate diverse needs and expectations of Alaska Native organizations
  - Engage Federal and State agencies / landholders in active management beyond established protection laws – ***for responsible commercialization*** – of biodiversity and high-value marine bounty and non-timber forest products
- Fundamental objectives:
  - Establish uniform system of access/utilization rights
  - Determine fair compensation for harvest
    - Critical for ability of corporate partners to compete in marketplace and generate revenues and economic development

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# “ Fair Treatment ” Agreement

- More advanced considerations include:
  - Prioritization of rural villages in most critical need of economic opportunities for resource commercialization
    - Many have >70% unemployment, are on the brink of total bankruptcy, have no infrastructure including running water or sewer facilities, no clinics/dental services, etc.
- Most advanced considerations include intellectual property (IP) rights of Alaska Natives
- Denali created a means to convert side-by-side orally passed knowledge into scientific methodologies
  - No disclosure of spiritual or culturally sensitive information
- Transform standard pharma/biotech industry royalty into more value for traditional knowledge

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# “ Fair Treatment ” Agreement

- Compensation criteria:
  - “Passive” access to land
    - Royalty on profits from commercialized product (0.5 - 2%)
  - “Guided” access to land
    - Profit-sharing (negotiated, up to 10%)
  - “Contributing” access to land and knowledge
    - Profit-sharing and patent rights (negotiated, up to 50%)
- Incentives for responsible corporate partners who:
  - Pay appropriate prices for raw products
  - Local processing to add value in the State of Alaska
  - Create rural/local employment
  - Contribute financial support to determine/establish sustainability of resources and minimize footprint
  - Conduct/share research to identify valuable new resources

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# Lessons from Alaska Natives

- Before “Western” acculturation, very low prevalence of cardiovascular disease, diabetes and cancer
- Most valuable for studies of “Nature vs. Nurture”
  - Cultures date to >15,000 YA
  - Role of diet in health/disease
    - Medicinal foods are staples in traditional Alaska Native diets
- Traditional medicine is practiced and viable
  - Untapped information for pharmaceutical discovery
- Impetus for developing flagship products
  - Abundant wild berries and rosehips
  - Future dietary supplements from other abundant subsistence foods, including fish (salmon), kelp, etc.

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# Fish-Derived Product Line

- Functional food ingredients from pink salmon
  - Market collapsed for canned product
    - Hatcheries throughout Alaska yield millions of unconsumed fish and rural streams are chock full while villagers "starve"
  - New market for RWD product with mild flavor and high essential nutrient content (i.e. omega-3 fatty acids)
    - Particular value for infant formula/food, enteral formulations, etc.
- "Waste" flesh and racks for calcium supplement
  - Natural bone provides Ca++, Mg++ and trace minerals along with Vitamin D, omega-3 fatty acids, and astaxanthin
  - Utilize millions of pounds of biomass instead of dumping
- Discarded roe is excellent source of nutrients
- Skin/scales used in cosmetics

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**Side View of Refractance Window® Drier (RWD)**

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**Dried Salmon Roe Flakes Exiting Drier Belt**

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# Marine Mammal PUFA Project

- Key observations and drivers:
  - Alaska Natives who consume high quantities of marine mammal fat (coastal populations) do not suffer from high rates of central nervous system (CNS) disease or depression
  - Interior populations tend to be more prone to depression
- To find the reason, seal oil prepared in a traditional manner as food is under analysis for novel essential polyunsaturated fatty acids (PUFA)
  - Many novel PUFA in addition to EPA and DHA
  - Compare / contrast to common salmon PUFA
- Enzymatically convert common salmon PUFA to novel seal PUFA, separate, and screen for CNS effects

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# Future Challenges

- Sustainability of marine and non-timber resources
  - Identify those appropriate for desired market
    - Nutraceuticals demand abundant resources and harvest volume
    - Cosmeceuticals consume far less resources (~10% of above)
    - Pharmaceuticals require very limited harvest and footprint
- Protect high intrinsic resource value during processing
- Supply chains
  - Determine fair prices for harvest
    - Critical for ability to compete in marketplace
  - Develop efficient logistical, transport and storage strategies
    - Minimize spoilage/waste and control shipping costs
- Establish priority villages for commercial partnerships

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# Contact Information


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