ELK VALLEY RANCHERIA, CALIFORNIA

ENERGY EFFICIENCY AND ALTERNATIVE ENERGY ANALYSIS

PROJECT CONSULTANT

THIS PROJECT HAS BEEN CONDUCTED IN COLABERATION WITH FRANK ZAINO AND ASSOCIATES

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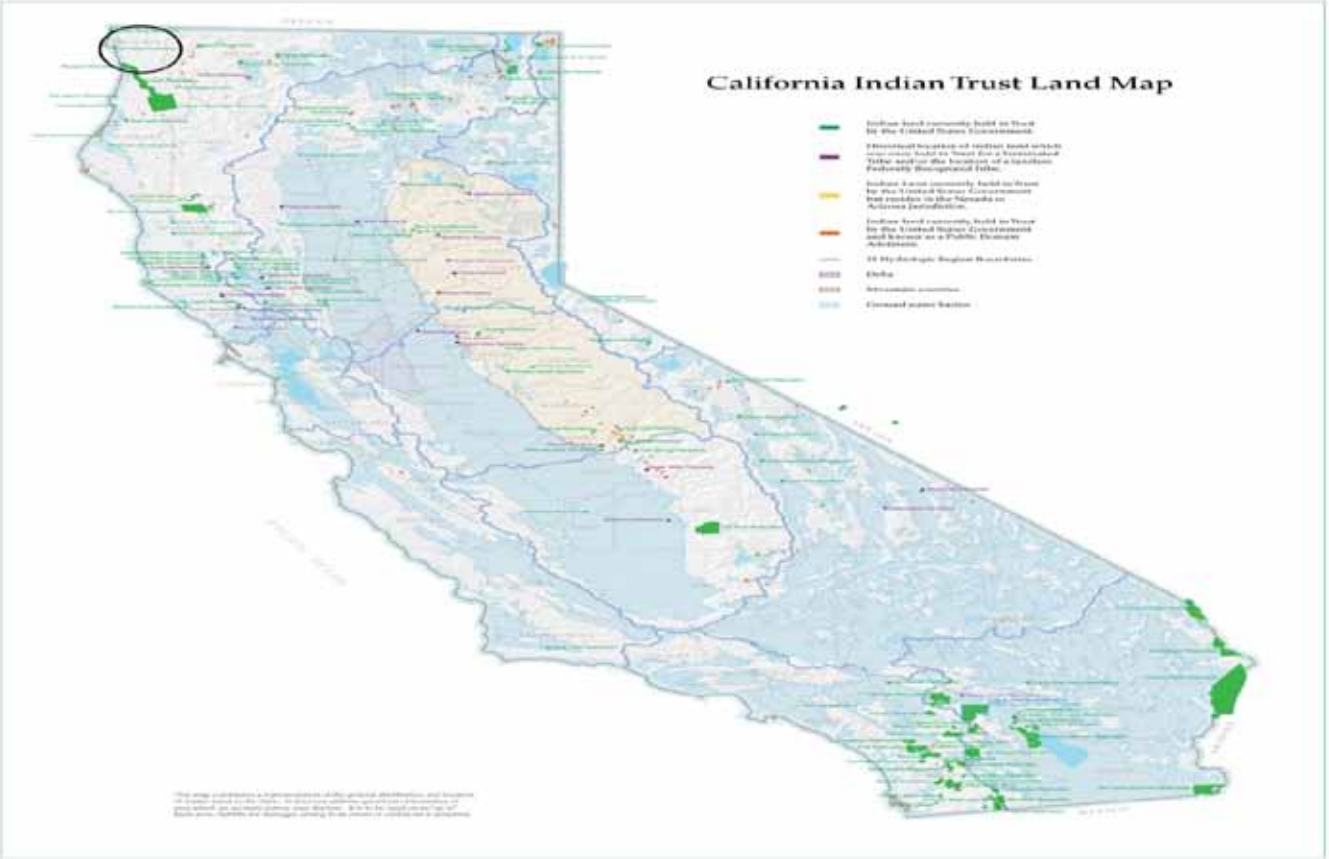
PROJECT LOCATION



ØExtremely Isolated and rugged.

ØIsolation contributes to increased cost of goods and services.

Figure 1-3 Elk Valley Rancheria Overview Map

TRIBAL HISTORY

Elk Valley Rancheria is located in Del Norte County, California. Del Norte County is California's northernmost coastal county, located roughly halfway between Portland, Oregon (330 miles north) and San Francisco, California, (350 miles south). Elk Valley Rancheria is located just outside the city limits of Crescent City, California, population 8,000. The Rancheria was established in 1908 as a home for displaced Native Americans from Tolowa, Yurok, Karuk and Hupa tribes.

The original reservation is approximately 100 acres, of which the Tribe owns less than 15% . An additional 500 acres has been acquired and placed into Trust for the Tribe since 1995.

ENERGY VISION

The Elk Valley Rancheria, California's stated energy vision is: "to achieve energy self-sufficiency that supports economic opportunity, cultural protection, environmental protection and the overall health of the Rancheria, Tribal citizens, Tribal facilities and the Tribal environment. The Tribe has supported this vision by developing a Strategic Energy Plan that will provide the foundation of the Tribe's long-term energy program. The Plan will allow the Tribe to make informed decisions regarding the integration of energy efficiency and conservation measures (ECMs) into existing buildings as part of ongoing operations and incorporating these ECMs and renewable energy resources into new and existing Tribal developments.

TRIBAL ENERGY GOAL

The initial goals of the Tribal Energy Program are:

1) To reduce energy consumption and associated expenses;

2) Environmental impacts associated with energy usage;

3) To develop renewable energy capacity to the extent feasible within existing and planned Tribal developments;

4) To enhance the Tribe's internal capacity to continue to accurately assess building energy performance by training and certifying one Tribal staff member as an energy auditor.

Building Energy Performance Assessment Categories

The primary categories of building energy performance assessment include:

- Building Envelope
- Lighting Systems
- Heating, Ventilation, and Air Conditioning (HVAC)
- Domestic Water Heating
- Plug Loads (refrigerators, offee-makers, vending machines, etc.)
- Utility Billing Analyses

LOCATION OF FACILITIES TO CONDUCT ENERGY EFFICIENCY ANALYSIS

- **Casino**

  2500 Howland Hill Road
  Crescent City, California
  95531

- **Administrative Building**

  2332 Howland Hill Road
  Crescent City, California
  95531

LOCATION OF FACILITIES TO CONDUCT ENERGY EFFICIENCY ANALYSIS

- **Community Center**

  2298 Norris Ave.
  Crescent City,
  California 95531

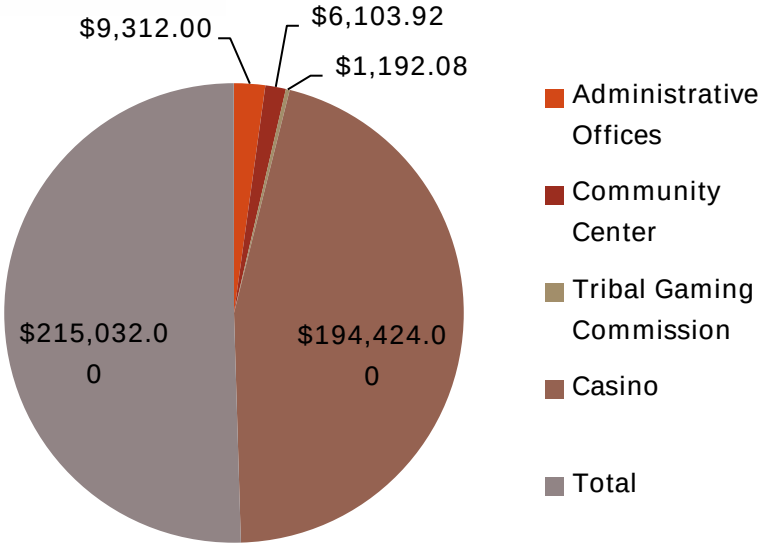
- **Gaming Commission**

  440 Mathews Street
  Crescent City,
  California 95531

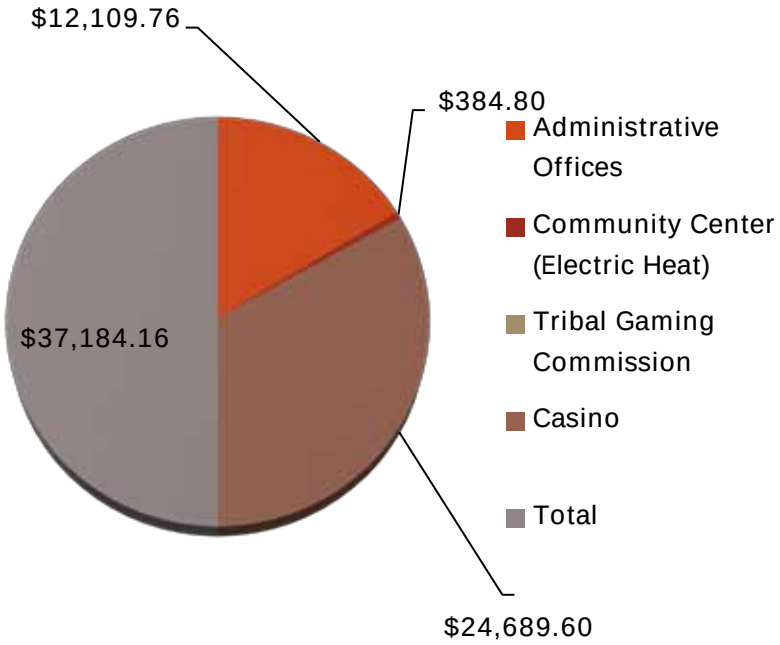
Facility	Annual Usage (gal)	Monthly Average (gal)
Administrative Offices	5,822	485
Small Community Center	185	15
Tribal Gaming Commission	0	0
Casino	11,870	989
Total	**17,877**	**1,489**

Facility	Annual Usage (kwh)	Monthly Average (kwh)
Administrative Offices	116,400	13,867
Small Community Center	76,299	6,358
Tribal Gaming Commission	14,901	1,242
Casino	2,430,300	202,525
Total	**2,687,900**	**223,991**

TOTAL FACILITY ENERGY COST

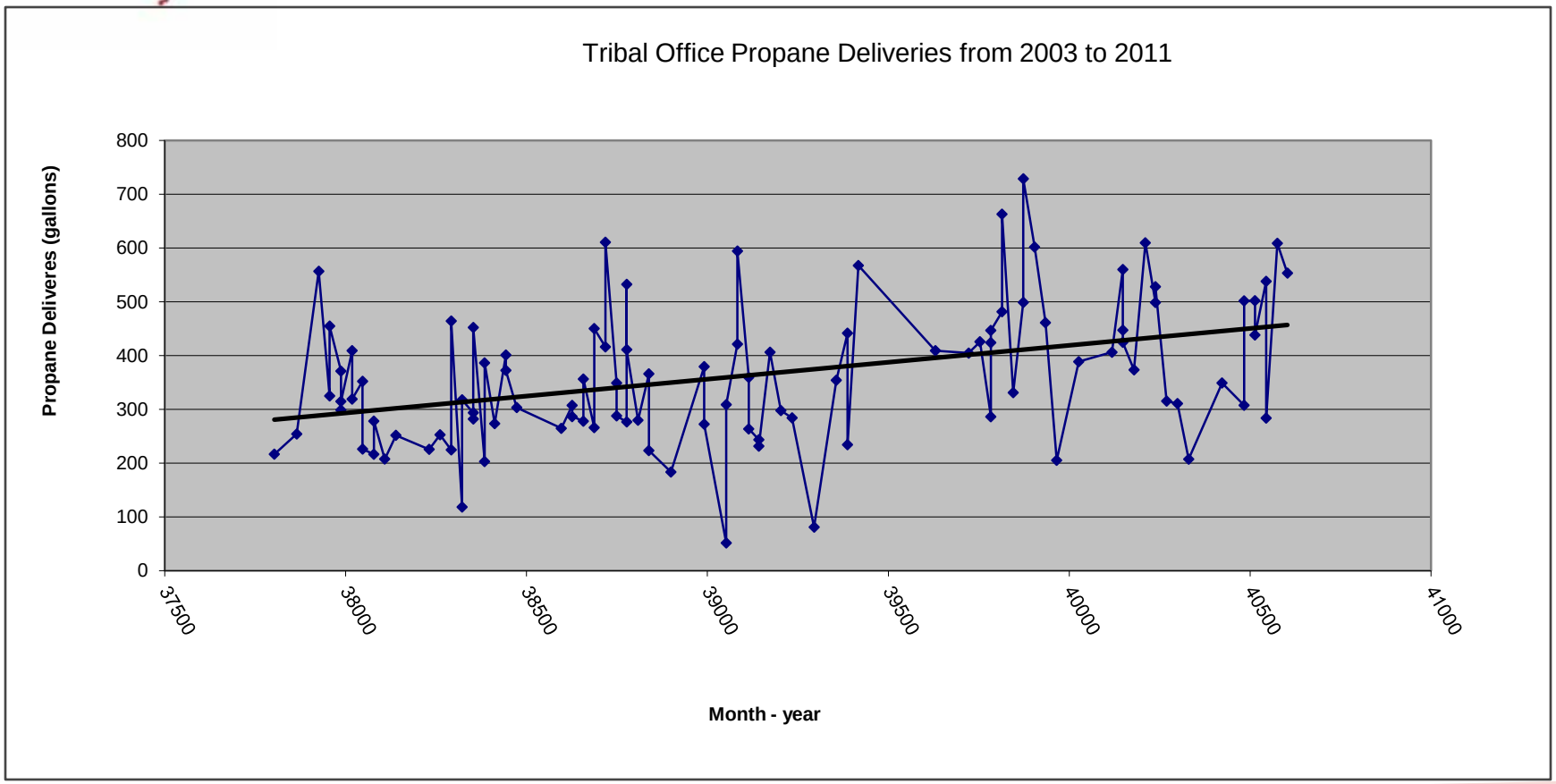


Annual Electric Costs



Annual Fuel Cost

Tribal Administration Building



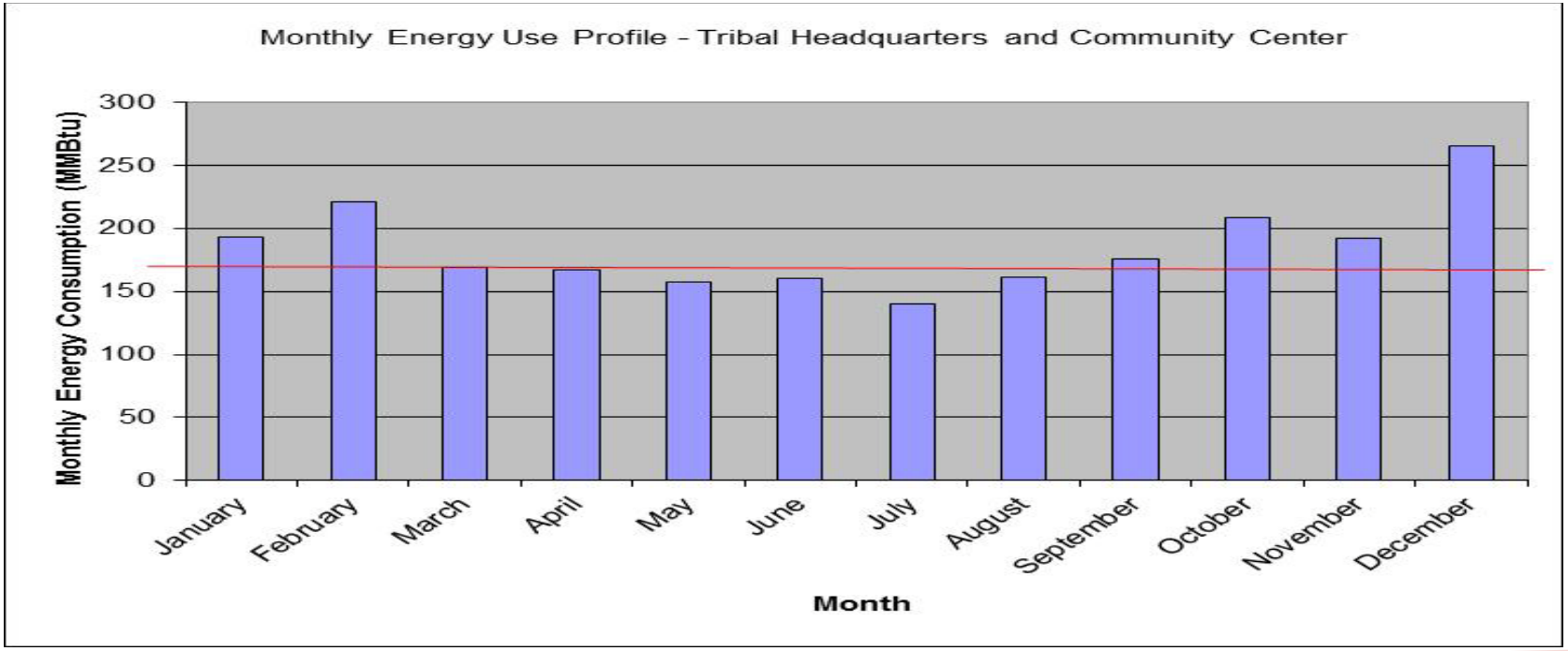
Tribal Administration Building

There are substantial leaks in the propane lines. Total leakage is indeterminate.

The building HVAC systems provide far too much heating capacity. This leads to several issues including: The tendency for furnaces to short cycle which causes furnaces to operate far below their nameplate efficiency because they are never allowed to reach “steady-state” operating conditions.

Tribal Administration Building

The Tribal Office and Community Center and Large Community Center uses 40% more energy than would be expected from a similar size building in Climate Zone #3, and has associated annual energy costs of $2.11 per square foot.



Tribal Administration Building

The main energy conservation measures modeled for the Tribal Administration include:

- Repair propane leaks.
- Reconfigure ducting to remove one 10-ton HVAC system from use in Community Center.
- Replace 12 propane HVAC systems servicing the Tribal office building with 6 high efficiency air source heat pumps.
- Replace existing incandescent Christmas lights with low wattage LEDs.

Typical outdoor condenser unit condition. Note damage to heat exchanger fins.

Tribal Administration Building

System	Area	Comments	Proposed Action
Building Envelope	Crawl Space	Standing water	Address adverse grades that drain to crawl space
Building Envelope	Crawl Space	Floor beam shear support	Inspect and replace as necessary
HVAC	Entire Facility	Propane leakage	Repair LP distribution leaks
HVAC	Entire Facility	Over capacity in both heating and cooling	Remove one 10-ton unit and air handler from Community Center and replace 12 "central" HVAC units with six properly sized heat pump units
HVAC	Entire Facility	Thermostats are publically accessible	Install locking covers on all thermostats
HVAC	Entire Facility	Damaged fins on condenser units	Repair as necessary during routine maintenance
Water Heating	Entire Facility	No insulation on hot water supply piping	Insulate all water lines as practicable; Minimum of 6' from the tank
Plug Loads	Entire Facility	Phantom Loads, Work Stations	Use power strips to reduce phantom loads. Use energy saving settings on office equipment
Plug Loads	Vending Machines	No VendingMiser conservation controls	Install VendingMiser or other conservation control

REVIEW ENERGY ALTERNATIVES

Review Alternatives with Tribal Council

- Solar
- Wind
- Small Hydroelectric
- Geo Thermal
- Wave Energy
- Bio Mass

Determine advantages and disadvantages of renewable energy sources, including their potential environmental, cultural and social impacts.

RENEWABLE SOURCES IN A NUTSHELL

Based on the Tribe's geographic location and the Tribe's current land holdings and types, the initial renewable energy resource assessment completed for this Strategic Energy Plan includes:

- Wave
- Solar (photovoltaic and thermal)
- Wind
- Geothermal (shallow earth temperatures)

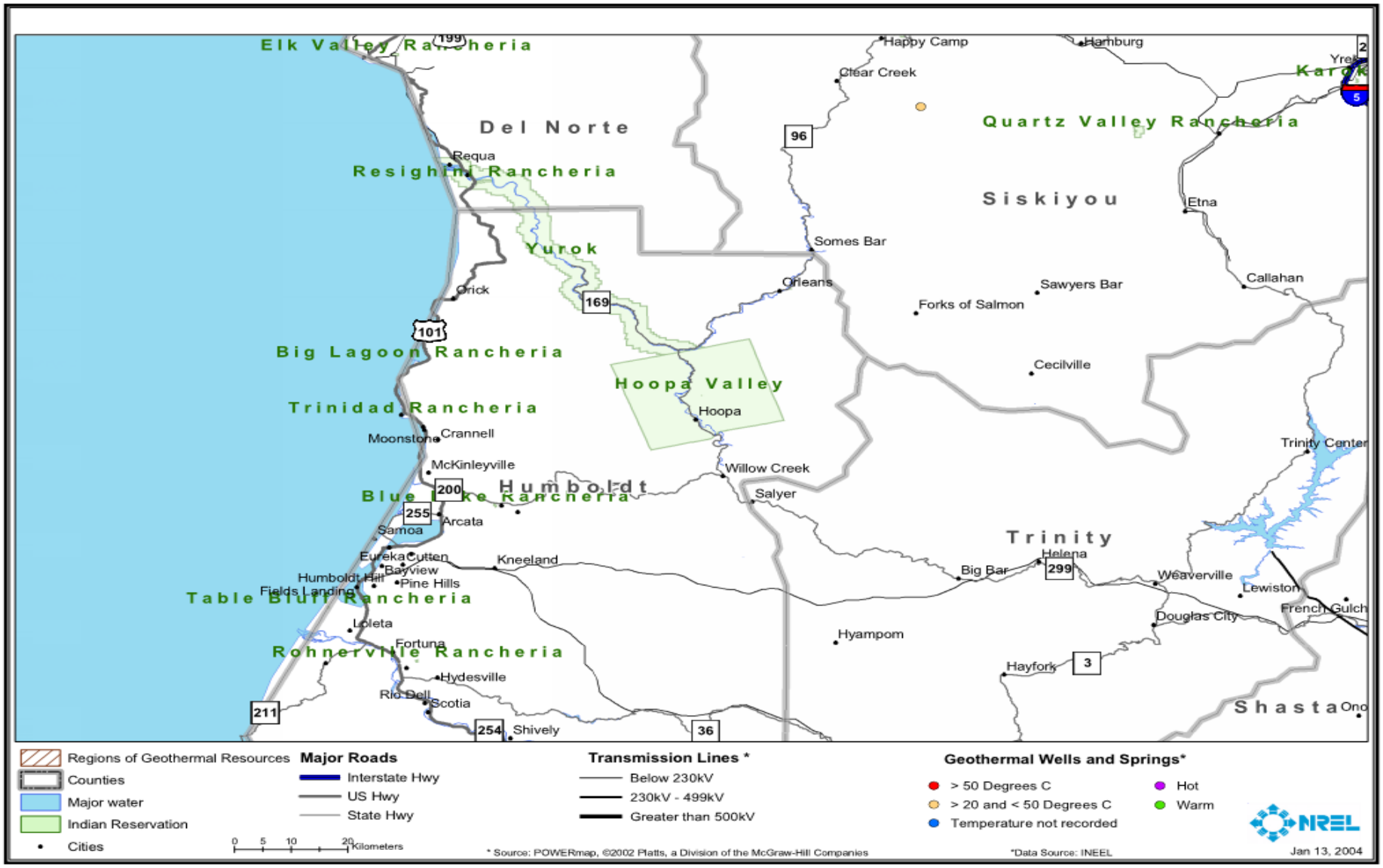
WAVE ENERGY

ØAnnual Casino Energy Consumption: 2,430,300 kWH.

ØCost Per kWH: **Average 0.08 cents.**

ØEVR currently has very low energy cost compared to the rest of California; the majority of power produced in the pacific northwest comes from hydroelectric.

ØThe best case scenario for wave energy: technology, regulatory framework, O&M, utility grid and if the community would support development of EVR Wave Energy Project, cost to EVR would equal **0.52 cents/kWH**. Not really worth the investment at this time.

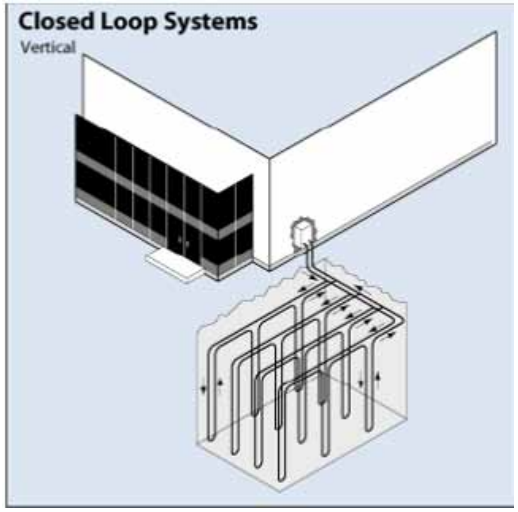

Elk Valley Rancheria
199
Happy Camp
Hamburg
Clear Creek
Del Norte
96
Quartz Valley Rancheria
Requa
Resighini Rancheria
Siskiyou
Etna
Somes Bar
Yurok
Orick
Orleans
Sawyers Bar
Callahan
169
Forks of Salmon
101
Big Lagoon Rancheria
Cecilville
Hoopa Valley
Hoopa
Trinidad Rancheria
Crannell
Moonstone
Trinity Center
McKinleyville
Willow Creek
Humboldt
200
Blue Lake Rancheria
Salyer
255
Arcata
Samoa
Trinity
Helena
Eureka
Cutten
Kneeland
Bayview
Big Bar
299
Weaverville
Humboldt Hill
Pine Hills
Fields Landing
Lewiston
Table Bluff Rancheria
French Gulch
Douglas City
Loleta
Hyampom
Fortuna
Rohnerville Rancheria
Hayfork
3
Hydesville
Rio Dell
Scotia
Shasta
211
254
Shively
36
Regions of Geothermal Resources
Counties
Major water
Indian Reservation
Cities
Major Roads
Interstate Hwy
US Hwy
State Hwy
0 5 10 20 Kilometers
Transmission Lines *
Below 230kV
230kV - 499kV
Greater than 500kV
Geothermal Wells and Springs*
> 50 Degrees C
> 20 and < 50 Degrees C
Temperature not recorded
Hot
Warm
NREL
* Source: POWERmap, ©2002 Platts, a Division of the McGraw-Hill Companies
*Data Source: INEEL
Jan 13, 2004

GEOTHERMAL ENERGY

As can be seen in previous Figure, there are no mapped high temperature geothermal resources on Tribal lands in the immediate region.

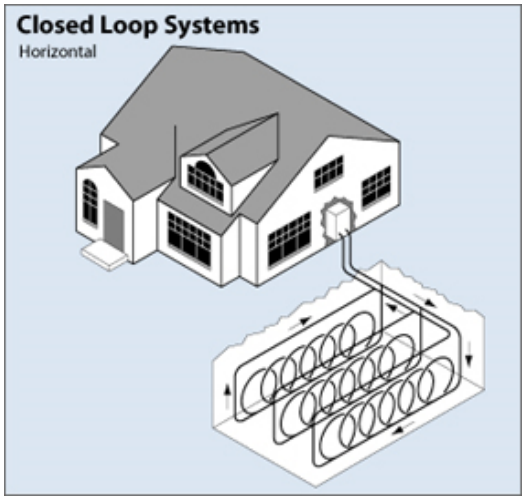
As a result, the Tribe focused on opportunities that utilize “shallow ground energy” as a geothermal resource in the Strategic Energy Plan.

ENERGY ALTERNATIVE SOLUTIONS



Ground Sourced Heat Pump – Vertical ground loops

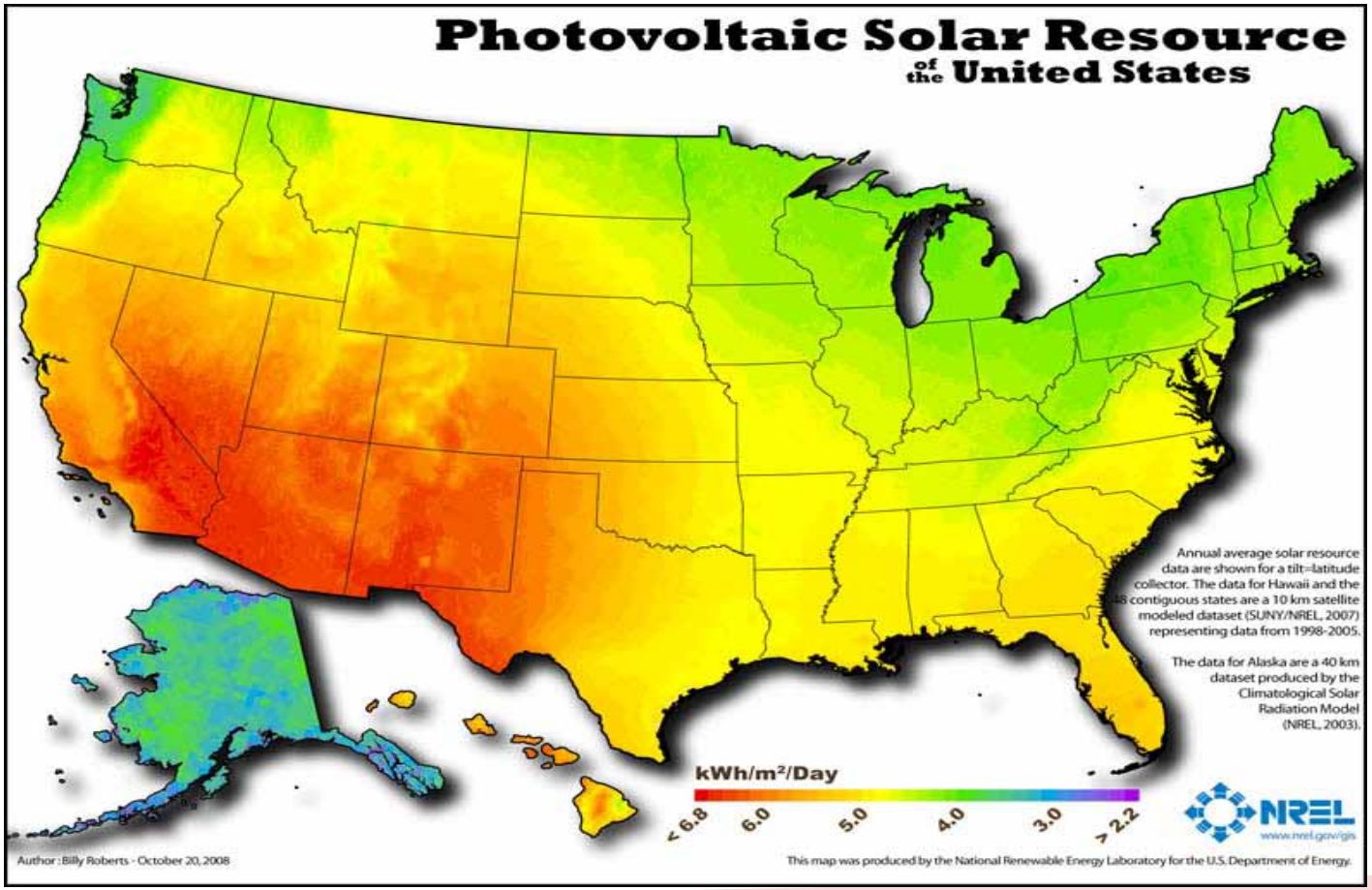
- Closed Loop
- Recycles medium for heat transfer
- Typical heat pump installation



Ground Sourced Heat Pump – Horizontal ground loops

- Ground Source Heat Pump
- Closed Loop
- Draws heat from wells with stable ground water temperature and returns to discharge well.

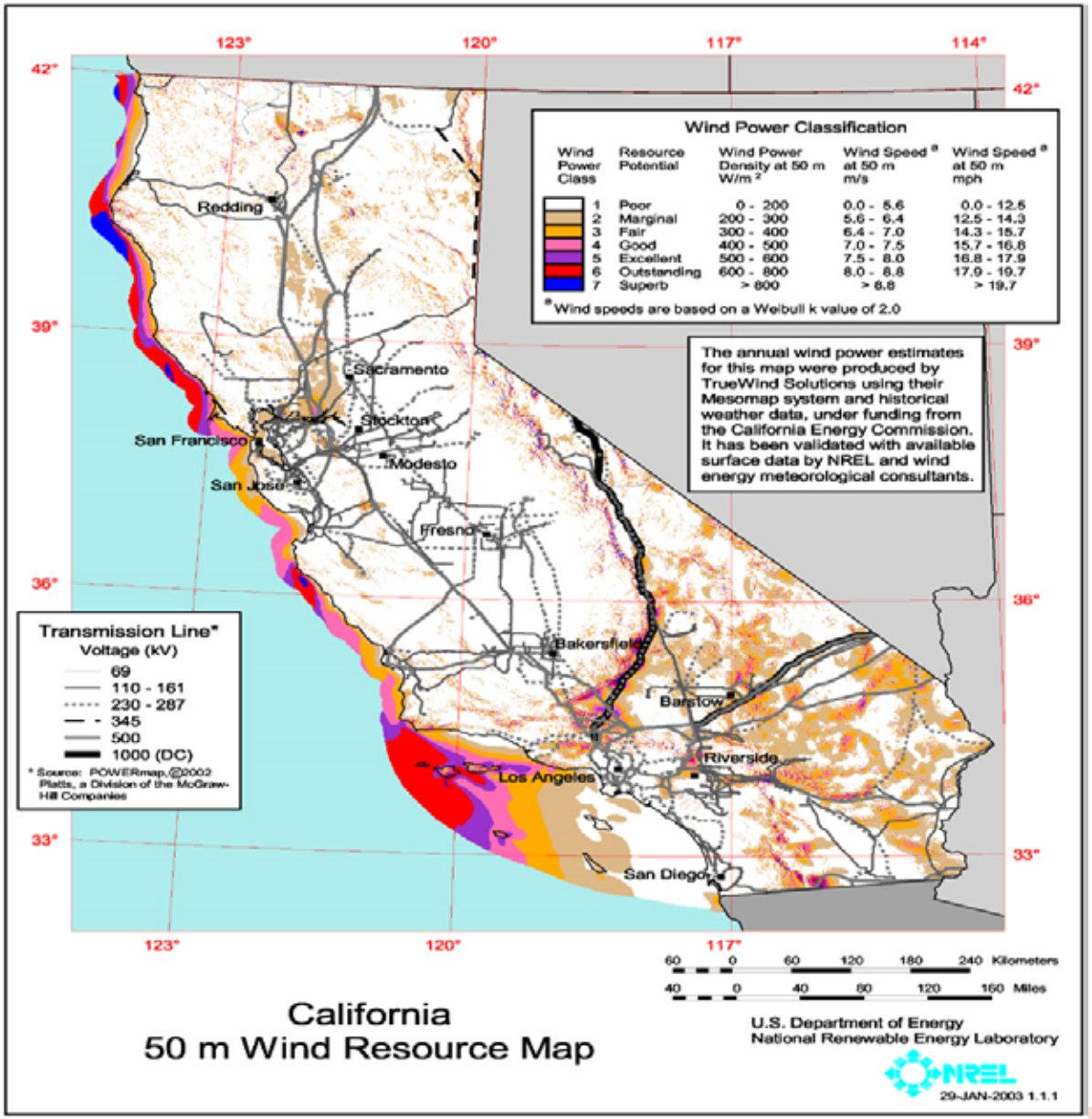
Annual Solar Energy Resources for the United States (NREL, 2004)



Redwood National Parks 60-kW roof-mounted photovoltaic array.

At 4.4 peak sun hours per day, the resource is higher than the resource in Germany, who has the largest installed solar capacity in the world. Additionally, the Redwood National Parks operate a 60-kW solar photovoltaic power system (approximately 300 roof-mounted photovoltaic panels) adjacent to the Elk Valley Rancheria lands. National Parks staff indicates that the system has been virtually "self-operating" since installation with no maintenance or troubleshooting. Therefore the results of this regional assessment indicate that solar energy resources in this region are a viable option for the Tribe to pursue.

California 50m Wind Resource Map (NREL, 2003)



WIND RESOURCES

As can be seen in the previous figure, the 50m wind resources for the Northern California region, where the Elk Valley Rancheria land holdings are located, are classified as "poor". At the level of resolution that these maps offer, this conclusion does not preclude the development of wind power on Tribal lands in these areas, though it does create reasonable doubt as to the opportunities that may exist. Anecdotal evidence supplied by Sun Wind SolarSystems (SWSS), out of Crescent City, California indicates that there are viable wind resources directly on the coast or offshore near Crescent City. However, SWSS indicated that due to the topography and development in Crescent City, inland sites tend to be restricted because of highly turbulent winds.

WIND RESOURCES

The vertical turbine system located near the Elk Valley Rancheria Tribal Office by Sun Wind Solar Systems has never performed as would be expected due to turbulent wind conditions. Because actual wind resource can be very localized, in order to quantify wind resource for a specific site, site specific data must be gathered. If the Tribe wishes to evaluate a site for potential wind resource, a minimum of one year of data is required in order to make an assessment as to the actual wind potential at the site.

Initial Renewable Energy Project Prioritization

Resource	Technology	Application	Comments	Priority
Solar	Solar Thermal	Head Start Facility	Sized to meet 70% of the load of the water heating load for each of the facilities	High
Solar	Solar Photovoltaic - Grid Intertied	Head Start Facility	Southern roof exposure, pitch and lack of obstructions lends itself to large PV installation	High
Geothermal	GSHP	Head Start Facility	Consider the adoption of GSHP technologies into equipment replacement projects. Complete economic analyses to determine cost effectiveness.	Medium
Solar	Solar Thermal	Tribal Office	Sized to meet 70% of the Tribal Office hot water load	Low
Solar	Solar Photovoltaic - Grid Intertied	Tribal Office	Southern roof exposure, pitch and lack of obstructions lends itself to large PV installation	High
Geothermal	GSHP	Tribal Office	Consider the adoption of GSHP technologies into equipment replacement projects. Complete economic analyses to determine cost effectiveness.	Medium
Solar	Solar Thermal	Residence #2 - 2295 Norris Avenue	Sized to meet 70% of the water heating load	Low
Solar	Solar Photovoltaic - Grid Intertied	Residence #2 - 2295 Norris Avenue	Roof top solar could support installation of up to 3 kW of solar photovoltaics; potential 30% annual electrical energy offset	Medium
Solar	Solar Photovoltaic - Grid Intertied	Tribal Gaming Commission Office	Roof top solar could support installation of up to 5 kW of solar photovoltaics; potential 25% annual electrical energy offset	Medium
Geothermal	GSHP	Tribal Gaming Commission Office	Consider the adoption of GSHP technologies into equipment replacement projects. Complete economic analyses to determine cost effectiveness.	Low
Solar	Building Orientation, Passive and Active Solar Heating and Cooling, Daylighting	New Developments	All new developments should include these technologies from the design stage through implementation.	High
Solar	Solar Thermal	New Developments	All solar thermal technologies should be considered when developing new projects.	High
Solar	Solar Photovoltaic	New Developments	Solar photovoltaics should be considered when designing and constructing new projects. Integrate essential project elements (conduit, stub outs, structural supports) as part of original design and construction to offset renewable energy system costs.	High
Geothermal	GSHP	New Developments	Consider the adoption of GSHP technologies into all new develoment projects. Complete economic analyses to determine cost effectiveness.	High
Wind	Wind Turbine	New Developments	Consider development of wind resources for all new developments. Minimum of 1 year of wind data required for assessment of feasibility	High

Renewable Technology and Resource Assessment Findings and Recommendations

The most abundant energy resource immediately available to the Tribe is solar energy. Geothermal (shallow earth) also represents a significant opportunity for implementation. Though the Wind Energy assessment did not immediately identify this resource as the most significant, it should be remembered that this assessment is based on regional wind data. If on-site indications are that a significant resource may exist on or near Tribal lands, a site specific wind study should be completed.

NEXT STEPS

All efficiency, conservation and/or renewable energy project implementation on Tribal lands will be accompanied by a data analyses program that tracks energy usage in the upgraded facility. This data is critical to quantifying the results (energy savings/offsets) of the Elk Valley Rancheria Energy Program. By tracking the performance of implementation projects, the Tribe will be best informed as to the most cost-effective and beneficial measures that it has employed to date, and will be better equipped to target such upgrades in the future.

QUESTIONS

"It is the Vision of the Elk Valley Rancheria to have respect and dignity for all, preserve our culture, be self-sufficient and diversified for the good of the Tribe, Community, County and Region."