AGENDA ITEM NO.

COUNTY OF HUMBOLDT

For the meeting of August 9, 2016

Date: June 30, 2016

To: Board of Supervisors

From: Robert Wall, Interim Director of Planning and Building

Subject: Community Development Block Grant 12-CDBG-8392 Final Closeout Report: Homebuyer and Economie Development Studies

RECOMMENDATION(S):

That the Board of Supervisors:

1. Receive Report
2. Open public hearing and receive public comment
3. Direct staff to submit final reports and studies to the State of California Housing and Community Development Block Grant (CDBG) Program.

SOURCE OF FUNDING: The California Department of Housing and Community Development (HCD) Community Development Block Grant (CDBG)

DISCUSSION: The County submitted a grant in 2012 and received an allocation of funds from CDBG to assist lower income qualified individuals to purchase their first home. The grant also included the preparation of three economic development studies:

- Comprehensive Economic Development Strategy (CEDS)
- Humboldt County 2014 Bandwidth Study
- Report of Acoustic Materials Development for Musical Instruments

Prepared by Paula Mushrush CAO Approval

REVIEW:
Auditor County Counsel Human Resources Other

TYPE OF ITEM:
____ Consent
____ Departmental
_X_ Public Hearing
____ Other

PREVIOUS ACTION/REFERRAL:

Board Order No.

Meeting of:

BOARD OF SUPERVISORS, COUNTY OF HUMBOLDT
Upon motion of Supervisor Seconded by Supervisor

Ayes
Nays
Abstain
Absent

and carried by those members present, the Board hereby approves the recommended action contained in this Board report.

Dated:
By:
Kathy Hayes, Clerk of the Board

As part of the close out of this grant the CDBG Program requires that the County Board of Supervisors and general public know what was accomplished and make available copies of any studies prepared.

The studies are attached for your review and may be provided electronically upon request. Note that the Board reviewed and adopted the CEDS in March 2013. This is your second review. Also, the Report of Acoustic Materials includes 482 pages of technical appendices which are not in the paper copy, but are in the electronic copy and can be made available upon request.

The summary of the homebuyer participants includes the number served and demographic data. The Grant served seven households, ranging in size from 3-5 members each. This included five two-parent families and two families headed by single mothers. Two heads of household were Native American and five were Caucasian, one of whom identifies as of Hispanic dissent. All heads of household were between 20 and 45 years old.

After receiving public comment, and upon Board direction, staff will submit a final close out package to the State.

FINANCIAL IMPACT: All eligible expenses have been requested and paid to the County. There is no effect on the general fund.

This meets the Board of Supervisors strategic initiative by supporting self-reliance of citizens by encouraging home-ownership. It also supports private-sector jobs by updating the CEDS and preparing related studies that will affect the ability of businesses to expand or, in the case of the acoustic study, will save jobs.

OTHER AGENCY INVOLVEMENT: There were several jurisdictions and agencies that participated in the CEDS process. A complete list can be found in that study.

ALTERNATIVES TO STAFF RECOMMENDATIONS: There are no alternate recommendations as this is a procedural step.

ATTACHMENTS:

- Attachment A – 2012 Comprehensive Economic Development Strategy Part I-IV
- Attachment B – 2012 Comprehensive Economic Development Strategy Part V, Targets of Opportunity
- Attachment C – Humboldt County 2014 Bandwidth Study
- Attachment D – Report of Acoustic Materials Development for Musical Instruments (there are 482 pages of technical appendices that are not included in paper form, but are available on request)

ATTACHMENT A
COMPREHENSIVE ECONOMIC DEVELOPMENT STRATEGY
PARTS I – IV

Comprehensive Economic Development Strategy 2013-2018

Humboldt County California

Parts I-IV

Final Adopted March 26, 2013

Funded in part with grants from:
WIA Rapid Response, CA Community Development Block Grant, and
The Davenport Institute for Public Policy & Civic Engagement at Pepperdine University

Prosperity! 2012

Components of the CEDS

Each component of Humboldt County's Comprehensive Economic Development Strategy (CEDS) is provided individually so that the user can easily print, read, digest and use them. Together, they comprise the complete CEDS.

COMPONENTS OF PROSPERITY 2012

Part I: Narrative Introduction
- Context for Updating and Demographics
- Using the Action Plan
- Evaluation Methodology

Part II: Overall Goals & Strategy

Part III: Action Plan for implementing the Strategy and accomplishing the Goals

Part IV: Prioritized List of Infrastructure Projects

Part V: Targets of Opportunity Report 2012: The eight industries offering the greatest opportunity for Redwood Coast residents

ADDENDA TO PROSPERITY 2012

A. Infrastructure Project Descriptions

B. Citizen Action Team recommendations

C. Citizen feedback

D. Overview of Prosperity 2012 process

E. Participants in the process

F. Northern California Tribal Economic Development Network (TEDNet) Strategic Plan

G. Humboldt 100 interviews report

Prosperity *(n)*: The state of having everything one needs to consider themselves fortunate or successful.

Part I: Narrative Introduction
Context for Updating

This update of Humboldt County's Comprehensive Economic Development Strategy (CEDS)—Prosperity 2012—comes amidst the nation's Great Recession. It identifies the industry clusters that demonstrate the greatest opportunity for Humboldt County's residents, despite economic boom and bust cycles, and lays out the goals, strategies and actions to make the most of Humboldt County's assets, challenges and opportunities. The Prosperity 2012 process has been business led through Target industry leaders building the work plans for their industries and through their guidance on the Industry Leader Council. Over 450 people have participated in the formation of the Prosperity 2012 CEDS update: business owners in each Target industry, elected officials, tribes, community leaders and citizens.

Located on the northern coast of California, Humboldt County is an extremely rural county of approximately 135,000 residents, including 11 recognized Native American tribes and 7 incorporated cities. Covering 3,568 square miles, the county includes a productive bay and harbor on the Pacific Ocean and stretches east into rugged, sparsely populated coastal mountains. The transportation distances and restrictions isolate Humboldt, resulting in an island-like economy. At the geographic center of the five-county Redwood Coast region—including neighboring counties Del Norte, Mendocino, Trinity and Siskiyou— Humboldt has the largest population and workforce and generates the most new jobs and firms in the region.

PROSPERITY! THE NORTH COAST STRATEGY

In 1999, the Humboldt County Board of Supervisors adopted *Prosperity! The North Coast Strategy* as the county's Comprehensive Economic Development Strategy (CEDS). An industry cluster-based strategy, *Prosperity!* established the foundation guidance that has guided economic development investments and regional collaboration effectively for over a decade. Prosperity 2012 builds on this foundation.

I. Strategic thinking about how to use limited resources for economic development—focus on these nine base industries, which export products and services to customers outside the region, and thereby, drive faster growth in jobs, wages and firms.
    - Lumber & Wood Products
    - Education & Research
    - Tourism
    - Fisheries, Processing & Aquaculture
    - Dairy & Dairy Processing
    - Manufacturing
    - Arts & Culture
    - Information & Technology
    - Specialty Agriculture & Horticulture

II. Listen to the needs and opportunities of base industries, as articulated by business owners and executives in the industries, and shape projects and programs to address their priorities.

III. Entrepreneurship is growing new businesses and jobs, so help those businesses to get established and scale up.

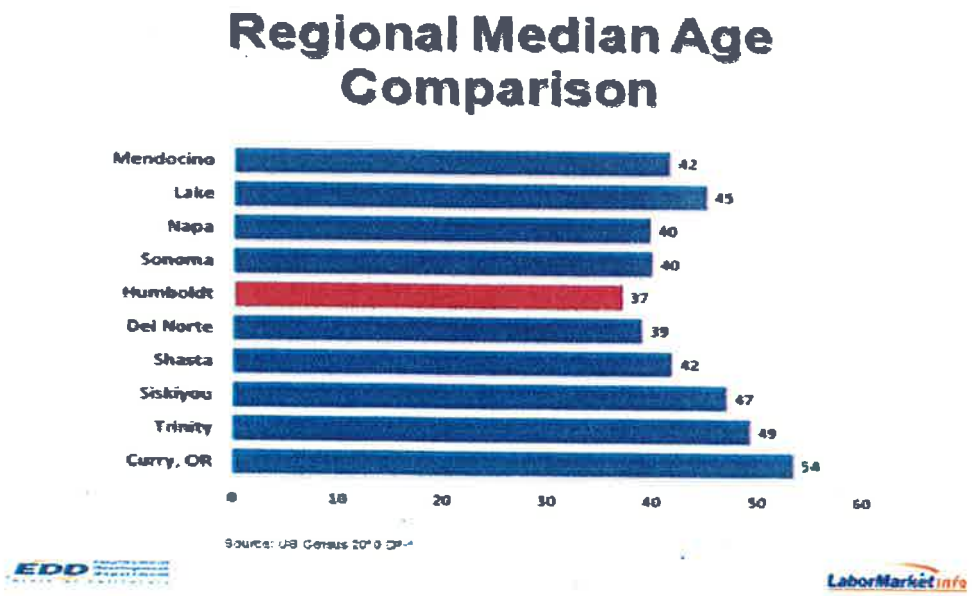
IV. Collaboration is an effective process for economic development agencies and jurisdictions to address barriers to business.

V. Small town, rural quality of life and access to natural amenities, such as the bay, rivers, forests and beaches, is a key economic asset anchoring talented entrepreneurs in the region.

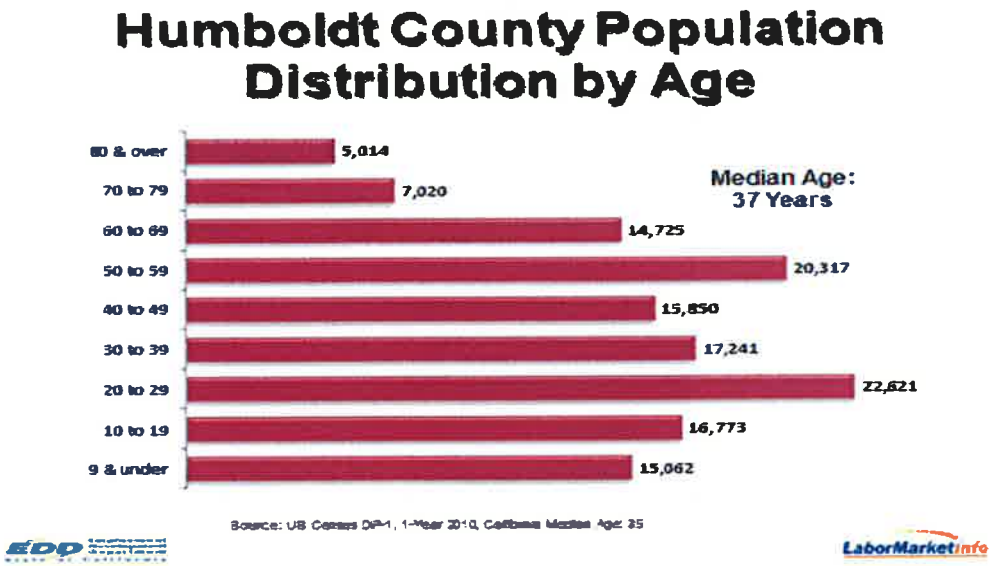
DEMOGRAPHICS

Since 1999, Humboldt County has changed. Total population increased from 126,518 residents in 2000 to 134,623 in 2010 for 6.4% growth between the decennials. And the county is still growing in 2011—amid Census estimates that show population contraction among a number of surrounding counties.

The County is aging—albeit slowly with the median age increasing from 36.3 in 2000 to 37.1 in 2010. Humboldt has the lowest median age in the region.

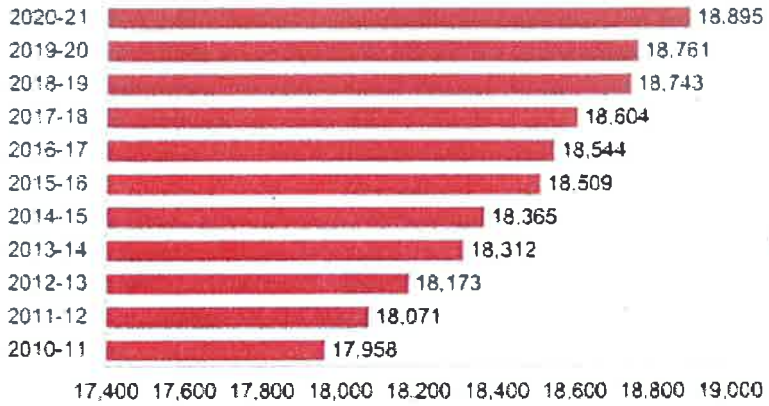


In spite of the region's lowest median age, Humboldt's total Baby Boomer population is significant—and starting to age out of the work force. Born between 1946 and 1964, Boomers started turning 65 in 2011, they represent about 28 percent of the county's total population. Fortunate for Humboldt, there are relatively large population cohorts following the Boomers, especially in the 20-29 age group. As expected much of this age group is comprised of students at the university and college. They hold many part-time and seasonal jobs in the community and many remain beyond their student years to fill jobs left vacant by retiring workers.



Again, unlike many rural and older counties in the region, Humboldt is projected to reverse a decade long trend of declining school enrollment. Area schools are forecast to add a net 937 K-12 students through the 2021 term. While many of these students commence post-secondary school or training, many enter directly into Humboldt's work force.

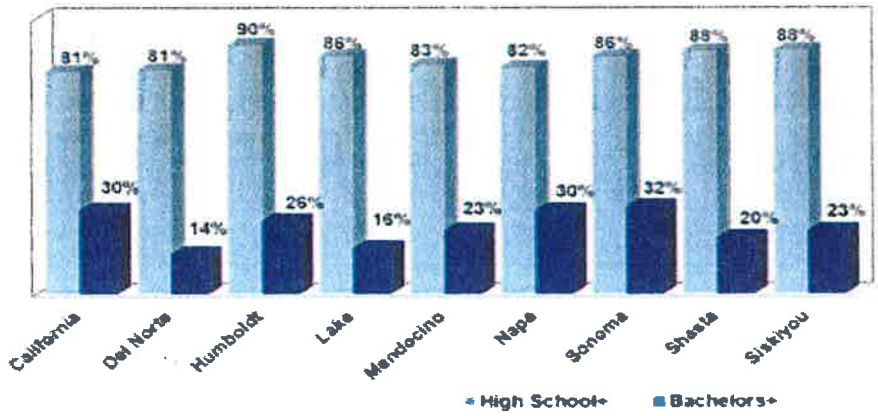
Humboldt Total K-12 Enrollment Projections 2010 - 2021



EDD Source: California Department of Finance, Demographic Research Unit, Oct 2011 LaborMarketInfo

Humboldt residents have reached higher levels of educational attainment than surrounding counties. About 90% of the county's age 25 and older population have high school diplomas or GEDs and 26% have Bachelor's Degrees or higher.

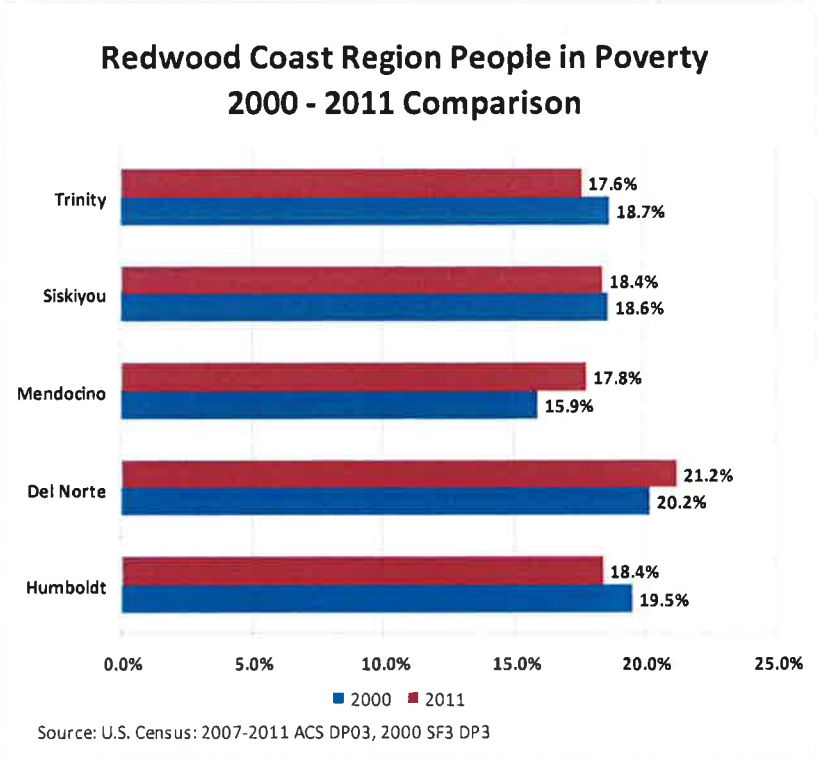
Educational Attainment Comparison Age 25 and Older Population



EDD Source: US Census State and County QuickFacts ACS 2006-2010 LaborMarketInfo

In terms of race, Humboldt is becoming more diversified. The White share of total population shifted from 85% in 2000 to 82% in 2010. The White population grew by 2.6%, adding 2,741 residents. The other-than-white population, as a group, grew by 27.2% adding 3,741 residents. In terms of ethnicity, the Hispanic or Latino (of any race) population added 5,001 residents, a 61% increased between 2000 and 2010.

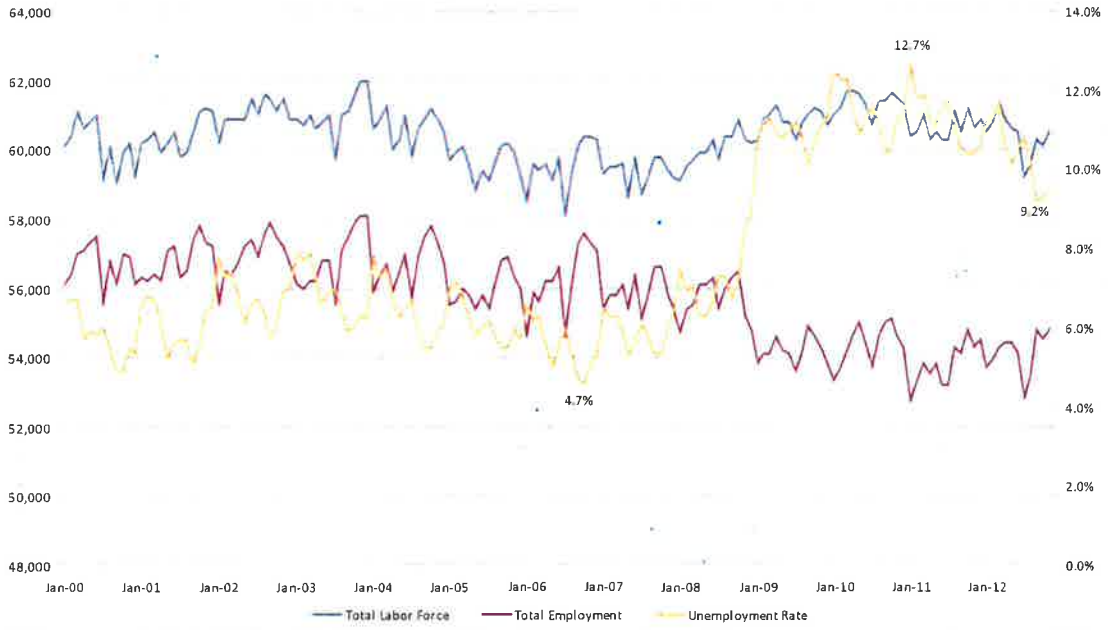
Nationally, rural county poverty rates have been consistently higher than urban counties since the 1960s when the data first became available. The Redwood Coast region is not an exception to the national pattern. The 5-county average is 18.7%, over four percentage points higher than the state as a whole. At 18.4%, Humboldt County's poverty rate is down from a longtime average of 19.5%, but still the incidence of poverty in Humboldt is high. There is much that we do not know about regional poverty; however, we do know that lower average wages greatly impact the economic well-being of our residents. Many families in poverty hold down several jobs. One purpose of economic development is to increase economic opportunities for residents, identify higher wage industries with demand occupations, and provide tools such as training and education that prepares low-wage earners to succeed in new jobs with higher wages, so that they can move out of poverty.



Humboldt's population growth, educated workforce, and increasing diversity are all positive indicators that the county is countering the national "brain-drain" trend of talented rural work force moving to urban centers, and has the potential to address some economic causes of poverty.

Through the 1980's Humboldt County's unemployment rate spiked up into double-digits, tracking closely with drastic downsizing in the timber industry, and above the state of California's unemployment rate. With the national recession that started in 2007, Humboldt County demonstrates a more stable and diversified economy with an unemployment rate that has tracked closely at or below the state of California.

Humboldt County Total Work Force, Total Employment, and Unemployment Rate 2000 - Present



ASSETS

Humboldt County faces persistent challenges—like geographic isolation, high poverty, and contracting historic industries—but also has bountiful opportunities. Humboldt County is a spectacularly beautiful place with talented, creative people who innovate and bootstrap both business and social solutions for the region and the world. Several assets cut across and define the upside of Humboldt County economically:

- A culture of entrepreneurship...people start businesses just to live here.
- Small town, rural quality of life anchors talented entrepreneurs in the region.
- Humboldt Bay provides a productive environment for aquaculture with expansion potential, the harbor a deep water port and essential facilities for the forest products industry, and together an asset for local and tourist recreation.
- Art is integral to Humboldt County's identity. Several times Eureka has been named one of the 100 Best Small Art Towns in America and said to be the place with the highest number of artists per capita in the United States. Not only do the visual and performing arts enhance the quality of life for residents, but they contribute to innovative businesses and vibrant communities. Arts, culture and design increase the competitiveness of emerging and mature industries, deliver a better prepared workforce, and catalyze community revitalization.
- An exceptionally beautiful, natural environment where the Redwood forests grow to the edge of the Pacific Ocean.
- Highly productive agriculture land with a long growing season and many micro-climates. Stan Parsons of Harare, Zimbabwe, developer of the Ranching For Profit Schools in the US, Australia, Canada, South Africa and Zimbabwe called Humboldt County "one of the most productive ranching countries I have ever been involved in. It's also perhaps the most picturesque and the most beautiful." Humboldt County is one of the few places in the world where beef cattle can be finished on grass. Excellent quality wine grapes, flowers and many other products are produced here.
- Water. Lots of water, and the pipes to move it. Humboldt County has a unique and valuable asset in its abundance of water and an infrastructure to deliver that water for industrial use.
- Humboldt State University (HSU) and College of the Redwoods (CR) are both large employers (HSU the second largest) in the county, and both sell education to people who generally live outside the county, infusing the county with over $300 million annually. Additionally, the students that HSU and CR train talented

people, many of whom become valued employees of local businesses, or start their own businesses.

- Highly productive forests for harvest and renewal. Humboldt County is one of the few places in the world that redwood grows well. Redwood is a premiere, niche wood product. Timberland owners are restoring the working forests and making investments that will keep merchantable trees growing for many years to come.

Challenges

Isolation and lack of an efficient system for transporting goods and people limits the Humboldt County economy. The nearest major metropolitan area, San Francisco (SF), is approximately 6 hours drive to the south, and the Interstate 5 (I-5) corridor is 3-hours drive to the east. California State Highways 101 and 299 form the primary transportation infrastructure (connecting to the SF Bay Area and I-5), with approximately 2,200 trucks moving in and out of the county daily (estimate from the Caltrans data). At this time, these highways do not accommodate common-size trucks for moving goods (as established by the Surface Transportation Assistance Act-STAA).

Humboldt Bay is a deep water port and supports some barging and shipping of logs in and out of Humboldt Bay. Aging docks, loading equipment currently increase costs and limit the potential of bulk shipping as well as cruise ships. Railroad access was suspended by Surface Transportation Board in the late 1990's due to storm damage, also limiting the Harbor's ability to participate in the national transporation system. Maintenance of the deep water channel requires dredging.

The regional airport consistently supports one commercial airline flying full flights through San Francisco (SFO). Forcing all flights through SFO increases costs, delays and travel time. There is tremendous demand for a diversity of routes and airlines to suppport business, student, tourist and personal travellers.

As a result, moving products and people in and out of Humboldt County remains extremely expensive. Our businesses cannot effectively compete in commodity markets, and must produce light, high-value, niche products that can easily be shipped on trucks.

Industries Evolve

Despite these limitations, businesses in Humboldt County have developed innovative, high value products in markets across the world. In 2007, the Humboldt County Workforce Investment Board published new data on six fast-growing industries driving

the Redwood Coast regional economy. The region includes the four rural counties surrounding Humboldt, and combined four criteria to set a high standard for industries offering the greatest opportunity:

1. Expanding Opportunity in job and/or firm growth;
2. Growing Quality in higher than average or increasing wages;
3. Improving Competitiveness in CA; and
4. Career Potential.

Targets of Opportunity identified six industries that grew jobs at 36% (versus the region at 8%), firms at 23% (versus the region at 1.5%) and wages at 20% (versus the region at 6%):

- Diversified Health Care
- Building and Systems Construction
- Specialty Food, Flowers & Beverages
- Investment Support Services
- Management & Innovation Services
- Niche Manufacturing

The 2007 *Targets of Opportunity* report both reinforced the focus on the base industries identified in *Prosperity*! and indicated the need to update to reflect new industries, challenges and opportunities. A 2012 *Targets of Opportunity* report provides the foundation industry data for the update of Humboldt County's CEDS. The updated 2012 Targets of Opportunity report shows that these industries have weathered the storms of three major national recessions. Additionally, the Forest Products and Tourism industries provide a substantial portion of our base economy and exports.

The Targets industries of Prosperity 2012 are somewhat different than the base industries of Prosperity 1999. Many of the sectors that made up the base industries are re-combined and included within the Target industries, as demonstrated in the table below.

Base Industry Prosperity 1999	Target Industry 2012
Fisheries, Processing & Aquaculture	Specialty Food, Flowers & Beverages
Dairy & Dairy Processing	
Specialty Agriculture & Horticulture (beef, flowers, crop farming)	
Arts & Culture	The arts are an asset in our economy, see p. 7
Information & Technology	Information Technology & Communications (ITC) cuts across all industries
Education & Research	Management & Innovation Services HSU & CR are assets in our economy, see p. 7

Manufacturing	Niche Manufacturing
Lumber & Wood Products	Forest Products
Tourism	Tourism
	Diversified Health Care
	Investment Support Services
	Building & Systems Construction

In addition to the Targets of Opportunity Report in 2007, this change in industries stems from lessons learned by economic development practitioners in the first twelve years of implementing Prosperity 1999. Two industries—Education & Research and Arts & Culture—are still included in the strategy, but viewed as *assets* in the Humboldt economy. These two industries do not operate like industries, but are clearly economic and community assets, even drivers in the county's economy. For instance, a small increase in student population at HSU or CR means greater dollars being spent in the local economy. Information & Technology cuts across all industries as a driving force in innovation, competitiveness and workforce demands. Viewing these industries as assets and cross-cutting the entire economy helps to focus attention and define better how to work with them.

The Elephant in the Economy

US Bureau of Labor Statistics (BLS) data is used to track the economy and characterize the Target industries. BLS is considered the gold standard of economic data, and comes from information reported by employers. There is no similar, reliable source of data for an underground industry, like marijuana cultivation. Still, it is widely known that the cultivation and sale of marijuana for medicinal and recreational purposes infuses a substantial amount of cash into Humboldt County's economy.

According to estimates from a 2010 study for a master's thesis, Humboldt County has approximately $416 million in unaccounted for spending, relative to other similar size counties in CA. That could be amounting to 26% of our taxable income. The same study estimates that about $1 billion of marijuana is grown in Humboldt County (wholesale value).

From a simplistic view of the economy, cash is good, the more the better. Certainly, personal incomes have been improved, and people are spending money with local businesses, supporting local jobs. Marijuana cultivation has also stimulated some innovation and entrepreneurship, particularly in soil amendment mixers and retail

growing equipment suppliers, data for which can be seen in the Building & Systems Construction industry.

There are also economic downsides to having an underground economy, including, but not limited to the following:

- Attracting youth and adults away from higher education and entry-level jobs from which a career could be built;
- Removing people from the workforce, who are needed and would otherwise aid in the growth of companies within the main stream economy;
- Increasing fire dangers in neighborhoods where houses are re-wired for indoor cultivation;
- Decreasing the availability of housing for people;
- Diversion of water from streams and rivers, which decrease fish habitat;
- Illegal grading of hillsides leading to runoff and destruction of habitat;
- Unregulated use of or dumping of fertilizers and pesticides;
- Damage to public and private property;
- Increased criminal activity, violence and gang activity;
- Increased need for law enforcement, courts and jails;
- A perception of Humboldt County as being all about pot and nothing else.

The question of how to address marijuana cultivation in economic development was taken up by one Citizen Action Team (CAT), which included a wide diversity of opinion. The facts that most funding for economic development comes from federal sources and marijuana cultivation and sale is illegal under federal law severely limits what economic development entities could do to help or hinder this "industry." The Industry Leader Council for Prosperity 2012 recommended that economic development keep its focus on the vast majority of the economy in the eight Targets industries. Building on the CAT recommendations, the ILC also recommended that the full scope of impacts from marijuana cultivation be analyzed, so that policy makers could have solid information, from which to affect law and policy (Action Plan Strategy A3-a).

Prosperity 2012 Process & Results

Over 450 people participated in Prosperity 2012, a public engagement and planning process designed to engage industry leaders, jurisdictions, non-profit leaders and the public on multiple levels, so that people are well informed about the industry clusters driving our economy and able to be strategic in their deliberations, recommendations and actions to grow the economy. A detailed description of the process can be found in

Attachment D: Overview of the Prosperity 2012 Process, and is summarized in these three phases:

Phase I (2010-2012): Gathering data and industry leader direction, in which economic data on the Target industries was updated and re-analyzed, and leaders in each Target industry met and developed strategic work plan for their industry. The work plans are contained in the 2012 Targets of Opportunity report. Native American Tribes also contributed through the Tribal Economic Development Network (TEDnet) strategy (Addendum F). This phase resulted in:

- Updated economic, industry and occupational trend data
- 8 strategic work plans for the Target industries

Phase II (January-December 2012): Public engagement process, in which the citizens, business and civic leaders and economic development professionals learned, discussed and proposed actions to advance the economy. Eighteen Citizen Action Teams (CATs) provided over 60 recommendations for action. The Industry Leader Council of approximately 12 business leaders from each of the Target industries evaluated and determined what actions will best help business grow in Humboldt. Cities, community service districts and the county prepared public works infrastructure projects. This phase resulted in drafts of the following four Prosperity 2012 CEDS documents:

1. Overall goals, strategies, challenges and assets;
2. An action plan that implements the strategies;
3. A prioritized list of infrastructure projects; and
4. A three-part evaluation methodology.

Phase III (January-March 2013): Three sponsoring, community-based boards—Headwaters Fund Board, Redwood Region Economic Development Commission & the Humboldt County Workforce Investment Board—will consider recommending the resulting CEDS for adoption by the Humboldt County Board of Supervisors, including:

- 2012 Targets of Opportunity Report;
- Prosperity 2012 CEDS documents (listed above); and
- Addendums to the CEDS: overview of Prosperity 2012 process; CAT recommendations; Northern California Tribal Economic Development Network (TEDNet) Strategic Plan; participants in the process; citizen feedback; Humboldt 100 interviews.

Public Engagement Process

Three public boards of community leaders from government, business and non-profit sectors—Redwood Region Economic Development Commission (RREDC), the

Headwaters Fund Board (HWFB) and the Workforce Investment Board (WIB)—sponsored Prosperity 2012.

- RREDC's board is a joint-powers authority and the board of directors includes elected officials from the county, each city, community service districts, special districts (like the Redwoods Community College District and the Humboldt Bay Harbor Recreation & Conservation Commission), and the Hoopa Tribe.
- The Headwaters Fund Board is a 7-member commission of the Humboldt County Board of Supervisors (BOS), appointed to recommend uses for the $18 Million Headwaters Fund, which is dedicated to implement the County's CEDS.
- The WIB is 30-member commission of the BOS, appointed to oversee the workforce investment system and funding.

For Prosperity 2012, these three boards provided the key staff and hosted five joint-public meetings for deliberations throughout the process. These boards reviewed and recommended the CEDS for adoption by Board of Supervisors, and are integrating the strategy into their policies and resource allocation decisions. The WIB served as the official CEDS Strategy Committee. (See the process overview, timeline and map in Addendum D.)

Industry Led

Industry leaders provided direction through three mechanisms. First, a cross-section of leaders in each target industry developed **strategic work-plans** to characterize the challenges, opportunities of their industry, and how the industry is addressing them. These work plans identify key issues, quick wins, strategies and actions to address challenges and opportunities for each industry. Common themes among the 8 target industries formed the foundation of the Prosperity 2012 Action Plan, into which Citizen Action Team recommendations were integrated by the Industry Leader Council.

Second, the Headwaters Fund staff conducted one-on-one interviews with over 100 business and community leaders regarding their sense of how the economy is faring and how it can be developed. These **Humboldt 100 interviews** formed the starting list of topics around which 18 Citizen Action Teams formed to study and recommended over 60 actions for inclusion in the CEDS.

Third, an **Industry Leader Council** (ILC) formed to advise the refinement of the economic development strategy, focusing the action plan and defining an evaluation methodology. The ILC includes a dozen business owners from the Target industries and the full economy. The ILC was asked to apply their business acumen and knowledge of economic drivers in the Target industries to focus our strategy on the highest value

actions. Their recommendations are incorporated as the Overall Goals, Strategies, Assets & Challenges; Action Plan; and Evaluation Methodology.

Tribal Input

In 2009-10, Humboldt County Economic Development Division commissioned the "Northern California Tribal Economic Development Network (TEDNet) Strategic Plan." A member of County Economic Development staff and TEDNet staff (located in the Office for Community, Economic and Tribal Development at Humboldt State University) interviewed tribal leadership in each Native American Tribe in the county about their projects, programs and plans for economic development. This plan provides essential input into Humboldt County's CEDS, and actions were integrated into the Prosperity 2012 Action Plan.

Jurisdictional Collaboration

The elected officials and staff of the county, cities and community service districts participated in four ways: (1) on the Board of RREDC and (2) in the Citizen Action Teams as described above; as well as through (3) the Infrastructure Prioritization Committee led by RREDC; and (4) the Prosperity Network. The **Infrastructure Prioritization Committee** included staff from each jurisdiction and was facilitated by RREDC. The IPC prepared descriptions of economic development infrastructure projects within their jurisdiction. Together, the committee scored and prioritized the projects into a comprehensive list for inclusion in the CEDS.

One of the most valuable products of implementing 1999 *Prosperity*! *The North Coast Strategy* has been the **Prosperity Network** (PN), a collaboration of economic development agencies providing services and implementing projects across the county and region. Prosperity Network includes:

- Redwood Region Economic Development Commission (RREDC)
- Arcata Economic Development Corporation (AEDC)
- North Coast Small Business Development Center (NC-SBDC)
- Humboldt Area Foundation
- Redwood Coast Rural Action (RCRA)
- Humboldt State University (HSU)
- College of the Redwoods (CR)
- Humboldt County Office of Education (HCOE)
- City of Eureka
- City of Arcata
- County Economic Development (the Headwaters Fund and the WIB).

The PN met bi-weekly to design and guide the Prosperity 2012 process. Staff of partner agencies participated in and liaised to the Citizen Action Teams. Additionally, PN has worked in the Redwood Coast region (Del Norte, Mendocino, Trinity, Siskiyou and Humboldt counties) to share strategies, data and collaborate on specific region-wide issues.

Citizen Engagement

Over 300 citizens of Humboldt County participated in five large public meetings (45-120 people) for Prosperity 2012 and through Citizen Action Teams and Business Leader Luncheons. As a result, Prosperity 2012 provides the context for business, non-profit organizations, education and governmental agencies to partner and pursue opportunities that benefit the Humboldt and Redwood Coast economy and community. Prosperity 2012 lays the foundation for accomplishing these desired outcomes:

1. The community understands the economy and industries that are driving our economy.
   - The industries and occupations with the greatest opportunity;
   - Economic assets of Humboldt County;
   - The data that best describes our economy; and
   - How everyone can participate in economic development.

2. The sponsoring boards and jurisdictions understand:
   - The community's priorities for economic development;
   - The proposed strategies and how they can implement them;
   - What each group of players—individual citizens, business, government and non-profits—can do to advance the economy; and
   - How the value to the community can be evaluated.

3. The sponsoring boards and jurisdictions will be positioned to integrate the strategy into their policy and programmatic decisions, for instance:
   - The Headwaters Fund Board grant and loan decisions;
   - The RREDC project and loan priorities;
   - City and county land use planning
   - City and county programmatic investments;
   - The Workforce Investment Board's local strategic plan, grant and programmatic focus.

4. Local business and non-profit organizations will be able to apply the strategy in their policy, programmatic and investment decisions.

Action Plan Purpose

The purpose of the Prosperity 2012 Action Plan is to identify priority areas and involve government, business, non-profit and citizens in coordinated and individual actions that result in a more prosperous economy. People and organizations with capacity to affect the outcome can use the Action Plan as a tool to focus their efforts.

Input Sources

- Target industry cluster leaders and their work-plans;
- Tribal Economic Development Network (TEDNet) strategic plan;
- Citizen Action Teams;
- Prosperity Network;
- Industry Leader Council.

Implementation Opportunistic

Leaders will look for the moments when leadership, funding, and the community are ready. That right timing cannot be predicted. In some cases, the project is clear, in process and funded. In others, we know what we want, but we don't know exactly how to achieve it. The Prosperity 2012 planning process puts the needs and goals in our minds so that when a funding opportunity arises, leadership can take action and determine community readiness to move that ball.

All Business is Good

If your business is not in the Target industries, how do you fit in? The focus on the Target industries is strategic and long-term. Fundamentally, as clusters of export-oriented businesses, the Target industries tap global markets and drive growth in the local economy. Increasing the efficiencies and market opportunities of the Target industries means that those businesses will bring more new capital into the region, purchase more goods and services from local vendors, attract talented staff, and employ more people with salaries to spend with businesses that focus on the local economy. Consider that...

- Improvements in business climate benefit all businesses.
- Many businesses are a hybrid of export & local sales, spanning multiple clusters.
- Workforce issues affect all businesses.
- Childcare is necessary for employees of all businesses.
- Entrepreneurship services are for all businesses.

Target Industry Work Plans

These are the fundamental source of the Action Plan, but do not replace the industry work plans (included in the Targets of Opportunity 2012 Report). Projects could still be formulated to address specific industry needs and opportunities.

HUMBOLDT IN THE WORLD

The Humboldt economy is significant within the Redwood Region, but tiny in the context of the global, national and state economies. Economies are complex, and larger than all of us in Humboldt County. We are one county of 135,000 people in a region of 5 counties, in a state of 38 million, in a nation of 50 states and 312 million people. The US is the largest economy in the world with $14.66 trillion of purchasing power. If we could simply divide the purchasing power by the number of people, Humboldt wields a whopping .043% of the nation's purchasing power.

Clearly, we will continue to be affected by regional, state, national and global economic forces. These forces, and state and national laws, drive and constrain the Humboldt economy in ways that we are unlikely to overcome. Our economic development strategy needs to take the best advantage of constraints and opportunities.

NOT A DIRECT LINE TO DRAW

For evaluation of our efforts, the reality of our size makes it difficult to draw a direct line between our economic development strategy and changes in economic indicators. For instance, no matter what we did, we still would have been affected by the national recession of 2007. So we don't want to mislead ourselves.

THREE-PART EVALUATION METHODOLOGY

Part I: Track larger economic trends, and how Humboldt is fairing in context. One main purpose of an evaluation methodology is to stimulate and support useful discussion about our economy. A **dashboard** of the following economic indicators will be useful for each of our Target industries and Humboldt County as a whole:

- Job production
- Average annual wages
- Firm growth
- Concentration of jobs in each Target industry cluster (versus the CA)
- Total workforce versus the population
- Demand occupations and skills

For context, the dashboard should compare Humboldt County to the Redwood Coast region including neighboring Del Norte, Mendocino, Trinity and Siskiyou counties, similar rural counties (such as Butte county in CA and Jackson County in Oregon), the state of California and the nation. Additional information in the dashboard could include population size, average age, unemployment rate, poverty rate.

Part II: Know more about what the Humboldt business community is thinking. A quarterly survey of business confidence that could be compared with a state or national survey would be useful.

Part III: Capture and Track the Implementation Activity and Outcomes. The Prosperity Network and many organizations and individuals will take actions to implement Prosperity 2012. Capturing this activity and the successes will provide essential feedback and a foundation for continuous improvement. The success indicators and process for capturing the data to report will be developed by the Prosperity Network, and may be integrated into the **dashboard**.

Overarching Goals

- Diversified, growing industries that export goods and services.
- A strong local economy that maximizes use of locally produced goods and services.
- Constant creation of new firms and jobs with wages that support a family.
- A business climate that welcomes and nurtures entrepreneurship, business expansion and strategic community-based problem-solving.
- Quality of life that supports enjoyment of nature, small town rural life and connection to community.

Strategies

A. Focus economic development resources on the challenges and opportunities of these 8 Target industry clusters, which utilize our region's assets and have shown significant opportunity for new jobs, entrepreneurship, increasing wages, export of products and services:
   - Diversified Health Care
   - Specialty Food, Flowers & Beverages
   - Building & Systems Construction
   - Investment Support Services
   - Management & Innovation Services
   - Niche Manufacturing
   - Forest Products
   - Tourism

B. Build a community culture that understands, welcomes and nurtures business.

C. Stimulate and nurture entrepreneurship with access to expertise, markets, capital and support.

D. Decrease regulatory complexity and increase permit certainty.

E. Build an "Infrastructure of Connectivity" to move people, goods , information into the global marketplace.

F. Plug leaks where we are now importing materials, products and services.

G. Improve regional capacity to train, attract and retain quality workforce.

Assets

- Redwoods meet the Pacific Ocean
- Small town quality of life
- Entrepreneurial culture
- Access to natural resources
- Artists and vibrant cultural communities
- Historic architecture and culturally significant places
- An exceptionally beautiful natural environment
- Humboldt State University & College of the Redwoods
- Abundant water supply and regional distribution system
- A bay and a port
- A regional airport
- A history of collaboration
- Active economic development agencies, capacity, capital & technical assistance
- Highly productive agriculture land, long growing season & micro-climates

Challenges

- Limited pool of entry-level and advanced skill workers
- Limited management and executive talent
- High input costs
- Business succession
- Lack of permit certainty
- Land with barriers to commercial and industrial development
- Expensive, inefficient transportation system
- Expensive, inconsistent broadband Internet services
- Airline service limited to SFO
- Integration of professional spouses
- High, persistent poverty
- Ailing/insufficient water and wastewater infrastructure

OVERARCHING GOALS

- ▶ Diversified, growing industries that export goods and services, bringing new capital to the regional economy and driving job growth.
- ▶ A strong local economy that maximizes use of locally produced goods and services.
- ▶ Constant creation of new firms and jobs with living wages.
- ▶ A business climate that welcomes and nurtures entrepreneurship, business expansion and strategic community-based problem-solving.
- ▶ Quality of life that supports enjoyment of nature, small-town rural life and connection to community.

Strategy A: Focus resources on the challenges and opportunities of the 8 Target industry clusters.		
	Diversified Health Care	Management & Innovation Services
	Specialty Food, Flowers & Beverages	Niche Manufacturing
	Building & Systems Construction	Forest Products
	Investment Support Services	Tourism
	Actions	
A1	Continue convening leaders in Target industries to update work-plans.	
A2	Establish a "voice for business" as advisors to economic development and to the Board of Supervisors and others, utilizing leaders from the Target industries (like Industry Leader Council of Prosperity 2012). Initial focus on actions in this plan such as:	
a	Transportation system real needs: Receive and advise technical experts looking at our transportation system and evaluating for most efficient methods for moving goods and people. (See E1)	
b	Business climate: Feedback to jurisdictions on regulatory and procedure changes; orientations for permitting staff, etc. (See B2)	
c	Promote successes and opportunities of Humboldt entrepreneurs (See B1)	
d	Speak to youth and students about entrepreneurship and business (See B1)	
e	Business-to-business mentoring and assisted networking (See C3)	
A3	Collect, analyze and communicate relevant information on regional economic health	
a	Quantify and describe the total economic impacts of the marijuana economy, recognizing costs to private and public lands, public health and safety costs, and environmental impacts so that policy-makers can be informed and advocate for solutions.	
b	Disseminate and analyze data on Target industries and economic performance (job, firm, wage growth, concentration, and occupational demand).	
c	Gather, analyze and disseminate regional business confidence survey	
Strategy B: Build a community culture that understands, welcomes and nurtures business.		
	Actions	
B1	Build community understanding, support for and pride in Humboldt businesses, entrepreneurship and the profit that flows from them.	
a	Regular social media, print, radio, and/or television programs that demonstrate how businesses contribute to the community of Humboldt, successes and opportunities in Humboldt business and industry	

	b	Program to arrange and support business owners to speak in classrooms consistently over time
	c	Encourage media to incorporate positive/constructive messages about business and the Humboldt economy
B2		Encourage jurisdictions to collaborate and develop a supportive climate for business start-up and expansion. Suggested actions include, but not limited to...
	a	Adopt a positive business climate policy that lays the foundation for community expectations, staff training, changes in policy/procedure and common measurement
	b	Support and direct regulatory staff to participate in one or more symposia on local business and their experience in the permitting process
	c	Develop common measures/indicators of a community culture that supports business
	d	Collaborate to develop, test and share successful practices, such as clear document maps/check lists for getting permits, aligning sequence of steps to permits so that it is similar from one jurisdiction to the next
	e	Send senior permitting staff to business training workshops to learn about new business start-ups, explain process, trouble-shoot
	f	Increase cost of filing a protest in order to fairly acknowledge the public and business investment in the project and to encourage early-stage problem solving. (Ranges from $1,500 to $25,000 in communities across CA.)
	g	Require that people protesting a permit demonstrate significant community support for their protest, such as a percent of the population signing a petition.
	h	Communicate and get feedback from Industry Leader Council or other business group regarding changes
	i	Develop regional solutions to serve business, such as locating industrial parks where most convenient for business and develop tax-sharing agreements and incentives to support.
B3		Pro-actively engage community (residents and regulators) in a discussion of modern agriculture practices so that siting and expansion opportunities for Specialty Food, Flowers & Beverage businesses are better understood and supported.
B4		Improve "welcoming" experience for visitors and residents of gateway towns, including safe pedestrian and bicycle transit, attractive signage that supports increased market potential. Include immediate business community and the arts in planning. For example, Willow Creek street trees project.

Strategy C: Stimulate and nurture entrepreneurship with continuing access to expertise, markets, capital and support.

		Actions
C1		Seek solutions and strategies to support business succession within the Target industries, so that mature business assets, serial entrepreneurs and workforce remain in Humboldt, and founders are able to retire
C2		Provide training and access to capital for business start-up and expansion, based on sound operating practices, including...
	a	Micro-enterprise and home-based business technical assistance and access to capital
	b	Higher level training for established businesses
	c	High quality, cutting edge expertise in marketing
	d	Business incubation programs for Target industries
	e	Pre-qualify local companies for bonding (entryway to procurement) and maintain comprehensive list
	f	Support mentoring that links seasoned business owners with new, growing business owners and managers
	g	Support tribal and extremely rural entrepreneurship with business counseling, train-the-trainer and expanded access to lending, like a Community Development Financial Institutions in tribal/rural communities.
C3		Develop and support business-to-business mentoring, assisted networking to connect entrepreneurs to resources and solutions

C4	Align regional marketing efforts of multiple organizations so that there is a clear and complementary strategy and messages across multiple agencies that promote and leverage the unique natural and cultural assets of Humboldt for local and export customers	
	a	Support learning symposia and planning on stewardship, eco, volunteer, industry, education, cultural and arts-based tourism to inventory assets and learn what consumers want that is aligned with local values, which could result in a county-wide cultural master plan.
	b	Change the name of the airport to better reflect the desired destination, e.g. Redwood or Humboldt Regional Airport

Strategy D: Decrease regulatory complexity and increase permit certainty.

		Actions
D1	Ready land and buildings for high value uses.	
	a	Update GIS mapping of commercial and industrial sites
	b	Complete environmental assessments and clear contamination concerns on Brownfield sites, and provide loans and grants to assist property owners.
	c	Review all jurisdictions current zoning and municipal codes and make recommendations for updating rules in each city and county to maximize principally permitted uses on commercial/industrial land; particularly evaluate policies that help/hinder manufacturing companies ability to be successful, competitive and efficient.
	d	Make over-the-counter permits available on-line
	e	Designate arts and culture districts, and leverage the arts to catalyze community revitalization and provide ingredients for business innovation (such as restaurants, outfitters, specialty food, niche manufacturing, etc.), increase public safety and increase tourist draws
D2	Complete process, infrastructure, permits and financing vehicles for commercial and industrial locations so that businesses with appropriate uses for the space can move into operations quickly. Suggested actions include, but not limited to...	
	a	Support development of co-work spaces with common office facilities, including artist/creative live-work spaces.
	b	Shared facilities, like co-packing, commercial kitchens, woodworking, etc.
	c	Develop a pubic-private wetland mitigation bank
	d	Simplify permitting policies to encourage creative re-use of historic and existing structures.
	e	Advocate for streamlined permit processing in the Coastal Zone as follows:
		•Change to singular jurisdiction within the Coastal Zone, so that either a city, the county OR the Coastal Commission (CC) processes and issues permits, not both city and CC, county and CC, which is duplicative and results in conflict and substantial cost to the public and the applicant
		•Review Coastal Zone boundaries
		•Cities and county update their Local Coastal Plans
		•CC review early so that projects can be adapted and designed for compliance with the Coastal Act
D3	Develop infrastructure to support Specialty Agriculture in rural areas, such as...	
	a	Wastewater and water facilities to allow tribal/rural development and expansion
	b	Irrigation to increase specialty agriculture opportunities
D4	Support aquaculture facilities development. Suggested actions include, but not limited to...	
	a	Complete regulatory review and permitting for a section of the bay so that shellfish farmers can begin cultivation

	b	Complete pre-permitting steps for land-based facilities for aquaculture development
D5		Support widespread watershed restoration to increase land and water quality for natural resources productivity
D6		Manage and restore lands, species and roadways for eco-tourism

Strategy E: Build an "Infrastructure of Connectivity" to move people, goods and information into the global marketplace.

Actions			
E1		Technically assess the transportation system, needs and opportunities for efficient movement of goods and people in and out of the county, including air (passenger and freight), rail, trucking and shipping. Engage with/report to both business leaders and elected officials through such groups as the Industry Leader Council and/or Humboldt County Association of Governments.	
E2		Include Target industry transporation needs in HCOAG Regional Transportation Plan.	
E3		Advocate for STAA truck access and smoother, faster movement of goods	Status
			Hwy 299 choke points reduced from 17 to 5 remaining.
			Hwy 299 Buckhorn Summit project to complete 2017
			Hwy 101 project at Richardson Grove proposed
			Hwy 101 Willits bypass in process
			Hwy 199 in Del Norte in process
			Hwy 197 in Del Norte in process
E4		Develop ubiquitous telecommunications connectivity and network redundancy throughout the region	
E5		Develop policies to support and incentivize local build out of broadband connectivity to the larger fiber optic lines, prioritizing areas with high concentration of Target industry businesses	
E6		Expand and improve cell phone coverage throughout Humboldt County.	
E7		Expand air passenger service capacity and destinations to meet market demand and connectivity to national network	
E8		Support study and development of air frieght terminal at ACV	
E9		Develop strategic plans for aviation system to increase general aviation and commercial aviation use	
E10		Modernize dock, harbor and marina facilities to increase revenues, concentrate freight, and expand Target industry opportunities:	
	a	Logs and chips	
	b	Tourist-serving facilities, including cruise ships, water trails, etc.	
	c	Break-bulk shipping import and export	
	d	Marine Highway (Short Sea Shipping) as a federal designation/program	

Strategy F: Plug leaks where we are now importing materials, products and services.

Actions		
F1		Increase circulation of capital in local economy in the following ways...
	a	Local benefit policy for public institutions to increase use of locally-owned general and sub-contractors for construction, and professional services (such as engineering, architecture, etc.)

	b	Provide return-on-investment analysis, cost-benefit for economy of local contracting
	c	Demonstrate transparent procedures that can be implemented so that local businesses have the opportunity to compete for purchasing contracts
	d	Demonstrate purchasing power of local consumers to enhance economy
	e	Survey businesses about goods and services they are purchasing out of the area to identify potential business opportunities and present to the community
	f	Identify ways that local investment mechanisms can be organized
	g	Increase understanding of how to contract effectively with large institutions and governments (local, state, tribal & federal)
	h	Increase knowledge of the expertise that lives locally.
F2	Develop and expand USDA-inspected food processing facilities and identify business opportunities, including	
	a	Specialty meat processing and production
	b	Wash/prep/cook facilities for food crops, fish and shellfish
F3	Identify and/or develop alternative energy sources (e.g. wind, small hydroelectric, biomass)	
F4	Identify under-utilized and discarded materials and the waste byproducts of local industry (esp. manufacturing, forest products and agriculture/food production). Develop "highest and best use" opportunities for waste reduction and end-use markets with in the local economy such as reuse or as feedstock for local manufacturers.	
F5	Support value-added manufacturing.	

Strategy G: Improve regional capacity to train, attract and retain quality workforce.

	Actions
G1	Seek solutions and methods to grow the pool of leadership talent (e.g. senior management, general managers, chief financial officers and marketing executives) to grow Target industry companies
G2	Provide career information on demand occupations in the Target industries for all ages
G3	Align disciplines, vocational opportunities and certifications with local workforce needs and occupations of opportunity.
G4	Articulate programs from high schools to College of the Redwoods to Humboldt State University
G5	Enhance and promote on-line distance learning opportunities, acquiring degrees and/or certificates, particularly in rural learning centers to overcome travel distance obstacles
G6	Stimulate and support new entrepreneurship among youth, students and career adults
G7	Recognize value of dependent care to a workforce and support initiatives to increase access to affordable, quality dependent care (e.g. child and elder care)
G8	Support apprenticeship training and ways for Humboldt to be an apprenticeship training center
G9	Provide resident quality of life and tourist-serving amenities, such as land and water trails, rehabilitation of historic and culturally significant buildings and sites, streetscape beautification and public art programs.
G10	Encourage art education and academic art programs to emphasize community engagement, heritage awareness and entrpreneurship to increase community benefits.
	CAREER ADULTS
G11	Develop a program for integrating new talent and their spouses into the community and work opportunities
G12	Develop ways to help people who grew up here or graduated HSU to "Boomerang" back, connect to jobs, businesses
G13	Stimulate and support career adult entrepreneurship (from career to business owner), building on Economic Fuel model and Corvallis, OR model
	COLLEGE STUDENTS

G14	Deliver the workforce knowledge/skills needed in the Target industries in HSU and CR curriculum and through class projects, internships and work experience for students
G15	Provide institutional, structured process to support student-business internships (e.g. definition of project and timeframe, supervision, etc.) so that the management burden is reduced and the quality of experience enhanced
	YOUTH
G16	Provide age-appropriate, meaningful opportunities for youth to learn about practical economics (e.g. markets, small business, personal financial management) and potential careers earlier (not waiting till High School Junior or Senior year), such as "Humboldt Live"
G17	Support career technical training in high school and community college (e.g. plumbing, welding, mechanics, truck drivers, electronic technicians, etc.) and applied academic learning meet industry standards and demand for skilled trades

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Part IV: Prioritized Infrastructure List of Public Works Projects

Jurisdiction	Project	Distressed Com'ty Score	Readiness Score	Funding Secured Score	Job Creation or Retention Score	Regional Wealth Generation Score	Target Industry Benefit Score	Total Ranking Score	Ranking Position
Willow Creek	Downtown Wastewater System Project	163.8	400	37.5	3	75	90	769.3	1
Eureka	Fisherman's Terminal Café & Retail Counter	94.1	300	81	100	100	40	715.1	2
Arcata	Happy Valley Business Park	94.9	275	40	100	75	60	644.9	3
Orick	Community Wastewater Treatment System	152.9	400	0	4.5	75	10	642.4	4
HBHR&CD	Water Trails - Improved Access for Boaters	90	325	30	100	75	20	640	5
Arcata	Community Life Wellness Campus	94.9	315	40	100	75	10	634.9	6
Humboldt County	Red Cap Rd Shoulder Improvement	90	400	75	4.5	25	20	615	7
Eureka	Food/Beverage Bottling Line	94.1	300	0	75	100	40	609.1	8
NCRA	South Fork to Samoa Line	90	225	0	100	100	90	605	9
Arcata	Samoa Blvd Business Redevelopment Project	94.9	225	10	100	75	60	564.9	10
HBHR&CD	Samoa Industrial Waterfront Development	115	300	25	0	25	90	555	11
HBMWD	15" Samoa Peninsula Pipeline Replacement	115	200	0	100	100	30	545	12
Eureka	Biosolids-to-Energy Facility	94.1	300	50	37.5	50	10	541.6	13
HBHR&CD	Northern CA Alternative Highway Project	115	200	0	100	100	20	535	14
HBHR&CD	Acquisition of of Freshwater Property	115	125	30	100	75	90	535	15
Eureka	Commercial Street Fuel Facility & Dock Upgrade	94.1	300	30	7.5	50	20	501.6	16
Arcata	Aldergrove Industrial Condominium Project	94.9	300	25	30	25	20	495	17
Eureka	Ice & Cold Storage Facility	94.1	200	0	99	75	20	488.1	18
Fortuna	John Campbell Memorial Parkway	72.7	200	85	7.5	25	90	480	19
Blue Lake	Industrial Pretreatment	99.2	100	0	112.5	75	90	476.7	20
Weott	Well Development	226.7	100	37.5	1.5	100	10	476	21
HBMWD	Ranney Collector 1, 2 & 4 Replacement	115	100	37.5	100	75	20	447.5	22
Eureka	Dock B Reconstruction	94.1	200	0	75	50	20	439	23
Humboldt County	Downtown Garberville Improvements	72	300	0	15	25	20	432	24

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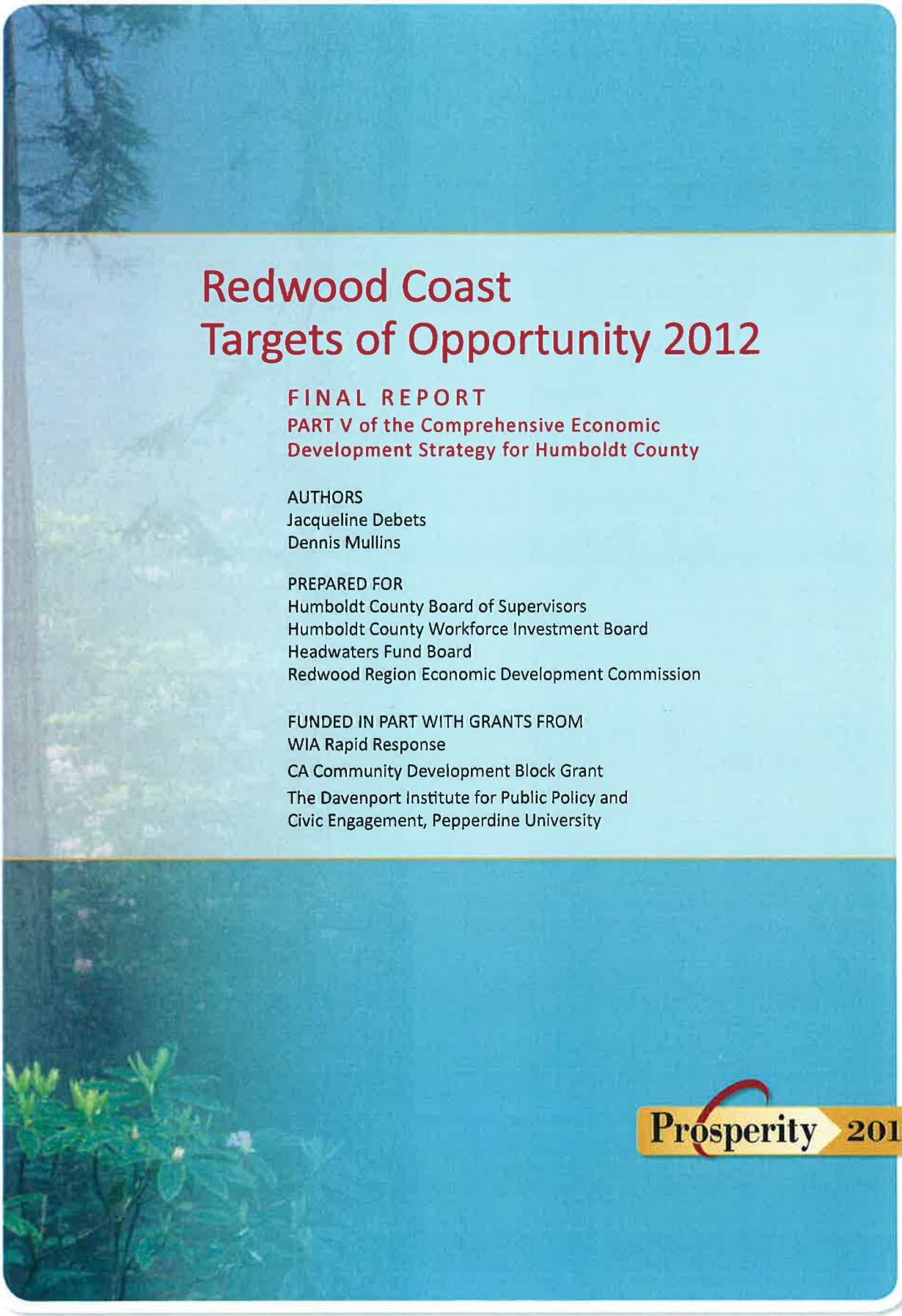
Part IV: Prioritized Infrastructure List of Public Works Projects

Jurisdiction	Project	Distressed Com'ty Score	Readiness Score	Funding Secured Score	Job Creation or Retention Score	Regional Wealth Generation Score	Target Industry Benefit Score	Total Ranking Score	Ranking Position
HBMWD	Chlorine System Upgrade to Hypochlorite	115	200	0	37.5	50	20	423	25
McKinleyville	Upgrade to Wastewater Management Facility	101.6	200	15	4.5	75	10	406.1	26
Weott	Collection System Upgrade	226.7	100	37.5	3	25	10	402.2	27
McKinleyville	Design of Water Management Facility	101.6	100	0	0	100	90	391.6	28
Eureka	Railroad Alternative Route	94.1	0	50	100	100	40	384	29
Humboldt County	Hoopa Corridor Improvement	90	200	37.5	4.5	25	20	377	30
Orick	Gateway Project	77.9	100	150	4.5	25	10	367	31
Fortuna	Mill District	72.7	150	60	22.5	25	10	340.2	32
Orick	Water System Improvements	152.9	100	37.5	0	25	10	325.4	33
HBMWD	Hydro-Electric Plant	90	100	37.5	16.5	50	20	314	34
Humboldt County	Hammond & Annie Mary Trail	90	145	7.5	1.5	25	10	279	35
Humboldt County	Arcata/Eureka Trail	90	145	7.5	1.5	25	10	279	36
HBHR&CD	Fields Landing Marine/Industrial Development	115	100	0	7.5	25	30	277.5	37
McKinleyville	Purchase of New Water Tank Property	126.6	0	0	0	50	90	266.6	38
McKinleyville	Design and Installation of Water Supply Tank	126.6	0	0	0	50	90	267	39
Fortuna	Thelma Street/HWY 36 Connection	72.7	100	25	7.5	25	10	240.2	40
McKinleyville	Teen Center Construction	76.6	100	0	0	50	10	236.6	41
McKinleyville	New District Office/Town Center	76.6	100	0	0	50	10	236.6	42
Humboldt County	McKay Tract to Harris Connector	90	100	0	7.5	25	10	233	43
Humboldt County	Broadband Infrastructure	90	50	0	4.5	50	10	204.5	44
McKinleyville	Acquisition of School Road Park Property	76.6	0	0	0	50	10	137	45
Orick	Telecommunications Project	77.9	0	0	3	25	10	115.9	46

HBHR&CD Humboldt Bay Harbor Recreation & Conservation District
HBMWD Humboldt Bay Municipal Water District
NCRA North Coast Railroad Authority

ATTACHMENT B
COMPREHENSIVE ECONOMIC DEVELOPMENT STRATEGY
PART V – TARGETS OF OPPORTUNITY



Redwood Coast Targets of Opportunity 2012

FINAL REPORT

PART V of the Comprehensive Economic Development Strategy for Humboldt County

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PREPARED FOR
Humboldt County Board of Supervisors
Humboldt County Workforce Investment Board
Headwaters Fund Board
Redwood Region Economic Development Commission

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Prosperity 2012

Table of Contents

I. Introduction

Executive Summary

Targets of Opportunity industries are those areas of the Redwood Coast regional economy—including Humboldt, Del Norte, Mendocino, Trinity and Siskiyou counties in the Northern coastal part of California—that demonstrate the greatest opportunity in new jobs, rising wages, new businesses and career possibilities for residents of this region. The Redwood Coast Targets of Opportunity industry clusters are comprised of 97 high-performing industry groups, selected from a few hundred across the five-county economy. Together, these six industry clusters demonstrate a combination of:

1. Expanding opportunity (job and/or firm growth);
2. Increasing wages;
3. Improving competitiveness (strong or growing concentration of jobs compared to California as a whole);
4. Expanding career opportunities (distribution of job opportunities across the occupational spectrum).

In 2007, the Humboldt County Workforce Investment Board applied these four criteria through the economic analysis model developed by Collaborative Economics for the California Economic Strategy Panel and published the original Targets of Opportunity Report. That study used 1990 as the base year and 2004 as the comparative, a 15-year timeframe spanning an overall regional economic growth trend, which was driven at the end of the study by the early years of the nation's housing and credit bubble.

In the first report, the six Target of Opportunity industries increased the number of jobs by 37%, the number of new firms by 23% and wages by an average of 20%. They represented 39% of the jobs and 53% of the payroll in the private sector of the region. Representatives from the Target of Opportunity industries indicated a huge demand for both entry-level and skilled workforce. The original Target of Opportunity industries include (in order of size by total number of jobs):

- Diversified Health Care
- Specialty Agriculture, Food and Beverages
- Building and Systems Construction and Maintenance
- Investment Support Services
- Management and Innovation Services
- Niche Manufacturing

How Industries are Classified

"Industry groups" are groupings of companies based on similar production processes, products, or behavior in financial markets, such as 3121 Beverage Manufacturing, as defined by the North American Industry Classification System (NAICS). The US Bureau of Labor Statistics (BLS) uses NAICS codes to collect, analyze, and distribute data about the economy, as do the similar statistical bureaus in Canada and Mexico.

"Industry clusters" are multiple groups concentrated in a geographic region and are interrelated by common markets, suppliers, customers and supporting institutions. For more information about industry clusters, see Michael Porter and the Institute for Strategy and Competitiveness. In a rural setting, the industry cluster definition is applied more broadly than on a national or international level.

Considered the gold standard, BLS BLS Quarterly Census of Employment and Wage data can be accessed and used for research on economies across the United States. The Labor Market Information Division of the California Employment Development Department analyzes and provides the data by region throughout California.

Using the US Bureau of Labor Statistics (BLS) data, this updated report takes a fresh look at which industries offer the greatest opportunity for the region, how the original six industries fared relative to the national economy's boom and bust cycle, and also identifies the industries projected to provide the greatest economic benefit within the Redwood Coast region moving forward. Additionally, this update includes the demand occupations and a strategic work plan for each industry, which was developed by the business leaders of that industry cluster. The combination of economic data, as well as social data reflecting the priorities of local business leaders, provides a profile of the current Redwood Coast regional economy and a clear vision for the region's economic future.

Together, the Targets of Opportunity industries now account for close to 42% of private sector employment and over half of private sector wages—and their overall impact is even more significant as the employees and firms in these sectors buy other goods and services within the region. These industries have grown faster than the region as a whole, despite the economic fluctuations and recent national recession. They also represent a sustained, structural shift in the Redwood Coast economy from predominantly resource-based industries to a diversified mix of industries that features a stronger knowledge-based component. The Target of Opportunity industries have also generated new jobs and firms while the region's resource-based economy contracted.

Impact of the Great Recession

This update uses an overlapping timeframe, with 1995 as the base year and 2009 as comparative. Unlike the original study, which followed a trend of strong overall growth in the target industries aligned with a robust national economy, this study ends with the 2008-2009 housing bust and stock market collapse, which prompted the most recent national recession, commonly referred to as the Great Recession. Taken together, the original report and this updated study bracket three economic growth trends and their meltdowns: the early 1990s savings and loans financial crisis, the early 2000s dotcom crash and the 2008-2009 housing bust and stock market collapse.

Despite the impact of the national recession, on average the six Target of Opportunity industries created new jobs while the region in general lost jobs. The Targets also lost firms at half the rate of the region, indicating a consolidation in firms, which can result in greater efficiency and productivity. The Targets also substantially increased average wages while wages in the Redwood Coast region averaged a slow increase. Overall, the six Target of Opportunity industries continue to provide opportunity for the region's residents—a combination of growth in jobs, wages, firms and occupations.

Figure 1-1: Targets Performance Comparison, 1990 - 2004 and 1995 - 2009

Criteria		Region	Targets
Job Growth	1990 - 2004	4%	37%
	1995 - 2009	-6.1%	13.7%
Firm Growth	1990 - 2004	1.5%	23%
	1995 - 2009	-15.5%	-8.8%
Wage Growth	1990 - 2004	6%	20%
	1995 - 2009	6.7%	36%
Target Industries now comprise 42% of private sector jobs.			

Findings, 1995 – 2009

- Together these sectors comprise 41.6% of the region's private sector employment (2009)—up from 34.4% in 1995. They also comprise over 50% of the region's private sector wages—up from 37.5% in 1995. Targets of Opportunity total wages grew by 36.2% over the period. In comparison, total regional private sector wages increased just 6.7%.
- Together, the number of jobs available in the sectors increased 13.7% while the overall regional economy shed 6.1% of its jobs.
- As expected in the current economy, firm loss occurred, but even in this area the Target's outperformed the overall regional economy. The number of Target firms dropped 8.8%, while the total number of firms in the region declined 15.5% between 1995 and 2009.

Targets of Opportunity Share Key Characteristics

- Five of the six increased the number of jobs available in their industries and all of them outperformed the region's job decline of 6.1%. The Targets of Opportunity gainers experienced job growth rates ranging from 11.4% to 93.6% over the 1995-2009 period while the single decliner—Specialty Food, Flowers and Beverages—shed 4.2% (primarily in Siskiyou county), almost two percentage points better than the regional economy as a whole. All six increased in share of regional employment.
- All six experienced growth in real wages (i.e., 1995 Wages Employment Cost Index adjusted for inflation to 2009) over the 1995-2009 period. The Targets of Opportunity experienced growth rates ranging from 10.5% to 27.4% over this period with five of the Targets paying an average wage that was higher than the regional average in 2009. In contrast, the region's total wage growth was 6.7%.
- All six have increased their employment concentration relative to the state average over this period. A concentration greater than one and increasing indicates that the industry is increasingly competitive and likely exporting goods or services outside the region.

- Five of the six Targets outperformed the region-wide 15.5% decline in the number of firms, with two of the six, Management and Innovation (+39.4%) and Investment Support Services (+8.9%) experiencing firm growth in spite of the economic downturn. Only Building and Systems Construction showed a net loss of firms (-12.8%) and it was a smaller loss than the region as a whole.
- All six Targets offer employment opportunities at the lower, mid and higher levels of the occupational spectrum. All of them have people working in occupations that are projected to be among the top 50 fastest growing jobs in the region in the next decade.
- Beyond the current recessionary period, all of these Targets of Opportunity have prospects for future expansion, especially if they can identify and recruit a skilled workforce. Employers involved in focus groups in each area identified specific opportunities for future growth, which are described in this report and in the industry strategic work plans.
- *Together, these Targets of Opportunity are important to every county in the region.* While the larger populations of Humboldt and Mendocino Counties naturally translate into a greater share of the employment, Target industries are also major contributors to the Del Norte, Siskiyou and Trinity County economies. In fact, the Target of Opportunity industries are responsible for over half of all private sector wages paid in the five-county region with all counties relying on Targets of Opportunity for a large proportion of their private sector wages.

Note from the Authors

Changes From the Original Approach

The original 2007 report was created by Collaborative Economics, an economics consulting firm in San Mateo, California. This updated version was produced by Humboldt County economic development practitioners Dennis Mullins, Labor Market Information Consultant with the California Employment Development Department assigned to the Redwood Coast region, and Jacqueline R. Debets, the County Economic Development Coordinator and Executive Director of Humboldt County Workforce Investment Board. Mr. Mullins mined the industry and occupational data and compiled the industry perspective. The pair then collaborated on the analysis and written presentation of the report, applying much of the original economic analysis methodology devised by Collaborative Economics.

This report does include one significant change in methodology. Like the original, this update looks at the total economy, highlights the highest growth sectors and provides industry data regarding jobs, firms, wages and concentration of jobs in the region versus the state of California. This report, however, isolates "self-employment" data from overall firm data in order to analyze entrepreneurship within each industry. As some self-employed individuals also work for employers and are accounted for within the BLS industry data, this method avoids double counting those "jobs". Analyzing both data sets also enabled the authors to identify overall industry performance and a strong indication of future firm expansion and job growth.

For this report, economic development professionals also facilitated meetings with business owners from each industry, primarily in Humboldt County, in order to define key issues, opportunities, quick wins and strategies for each industry. That insight and direction was then incorporated into industry cluster profiles and work plans (included in this report) that outline initiatives/projects designed to further strengthen Target businesses and the regional economy as a whole.

Originally, Collaborative Economics produced a separate Occupations of Opportunity report. After sharing the findings of the original report, many people wanted to know "What jobs?" Consequently, this report includes a demand occupation section for each industry and a summary of occupational trends for all Target industries. The authors anticipate producing a more in-depth analysis of occupations as a follow up to this report.

Forest Products and Tourism

Since the information in this report will be used as the foundation for future economic development strategy and planning, the authors stepped back from the Targets of Opportunity methodology and took a broader look at the Redwood Coast region's natural economic assets in order to insure that regional opportunities outside the Targets of Opportunity were not overlooked. Forest Products and Tourism are two base, or export, industries that clearly capitalize on regional assets. While these two industries do not meet all the criteria of the Targets of Opportunity economic analysis methodology, they meet some of the criteria and offer significant opportunities for the region's residents.

Forest Products provides approximately 4,600 jobs in the region, which is almost 11 times more concentrated than industry jobs in the state of California as a whole. Humboldt and Mendocino counties grow redwood, a valuable specialty wood, and lead the forest products industry for California. Close to 2,400 jobs are anticipated to open in this industry by 2018 as current employees retire (replacement jobs) and average wages for these jobs is 30% higher than the regional average. Forest Products is the historically dominant industry of the region and while it is not as vibrant as in years past, it still makes up a substantial portion of local exports and contributes greatly to the local economy.

Additionally, jobs in the Tourism industry are four times more concentrated in the Redwood Coast region than in the State of California. Spectacular natural resources draw tourists from around the world and add capital to the economy. The natural and manufactured assets of the region—redwood forests, Pacific Ocean with open beaches, lush pasture land, wild rivers, rugged mountains, Victorian towns, vibrant artists, delectable foods and beverages—offer tremendous opportunities for entrepreneurship and an opportunity to capitalize on the fact that California is an international tourist destination.

As noted earlier, despite these strong economic indicators, Forest Products and Tourism do not meet the four criteria established for a "Target of Opportunity". For instance, Forest Products has been shedding jobs for many years as the industry goes through a major restructuring and Tourism does not meet the criteria of increasing or offering higher than average regional wages, primarily due to a high number of part-time and seasonal jobs. However, the Forest Products industry does appear to be stabilizing and the Tourism industry has experienced some job and firm growth as well as importing substantial capital to the region. For these reasons, Forest Products and Tourism are also examined in this report.

The six original Targets of Opportunities industries will be described as "Targets of Opportunity"; with the addition of Forest Products and Tourism, the eight industries are called the "Target Industries."

Early Feedback

In order to provide a complete and clear presentation of the information, the authors also gathered and incorporated feedback from several business and community leaders, including Ken Musante, Ginger Weber, Bruce Hamilton, Cedar Reuben, Patrick Cleary, Kathy Miller, Dawn Elsbree, Jon Sapper, Cheryl Dillingham and Philip Smith-Hanes. John Melville of Collaborative Economics also provided valuable feedback. The authors extend their deep appreciation for their time, insight and direction.

They also wish to thank Lynette Mullen, who gathered, organized and edited the report content, as well as Jennifer Perez of Open Window Design, the graphic designer who made the report appealing to read.

Glimpse of the Future

The Targets of Opportunity industries are producing jobs faster—with higher wages—than the general economy. In this report, each industry profile includes a complete table of the demand occupations, grouped by high, mid and lower wage levels. While more, lower wage jobs are to be expected, six of the eight Target industries pay at least 29% higher than the regional average wage and seven of the eight Target industries increased wages from 1995 to 2009.

The fastest growing industries are also the highest paying. Management and Innovation Services pays 47% higher than the regional average wage. This industry cluster also grew new jobs at 93.4% and new firms at 39.4% over the study period. Niche Manufacturing pays 42% higher than the regional average and grew new jobs at 33.2%. Investment Support Services pays 31% higher than the regional average, increased jobs at 11.4% and produced new firms at 8.9%. These three Target industries far out-performed the region as a whole, continuing to grow jobs, wages and their overall competitiveness.

These fast-growing, high-wage industries are also knowledge-based, which indicates decreasing dependence on resource-based industries in the Redwood Coast region. It is noted in the Occupations Summary that currently government occupations pay higher than private sector jobs in the region but the fast growth of these high-wage Target industries could reverse that balance toward the private sector.

Figure 1-2: Average Wages by Industry

Industry Cluster	Average Wages		Difference		Size Order*
	Industry	Region	$	%	
Management and Innovation Services	$ 43,940	$ 29,794	$ 14,146	47%	7
Niche Manufacturing	$ 42,366	$ 29,794	$ 12,572	42%	8
Investment Support Services	$ 38,886	$ 29,794	$ 9,092	31%	6
Forest Products	$ 38,591	$ 29,794	$ 8,797	30%	5
Diversified Health Care	$ 38,402	$ 29,794	$ 8,608	29%	1
Building and Systems Construction	$ 38,393	$ 29,794	$ 8,599	29%	3
Specialty Food, Flowers and Beverages	$ 27,929	$ 29,794	$ (1,865)	-6%	4
Tourism	$ 13,685	$ 29,794	$ (16,109)	-54%	2

*Size defined by total number of jobs in the industry cluster.

Entrepreneurship Capacity

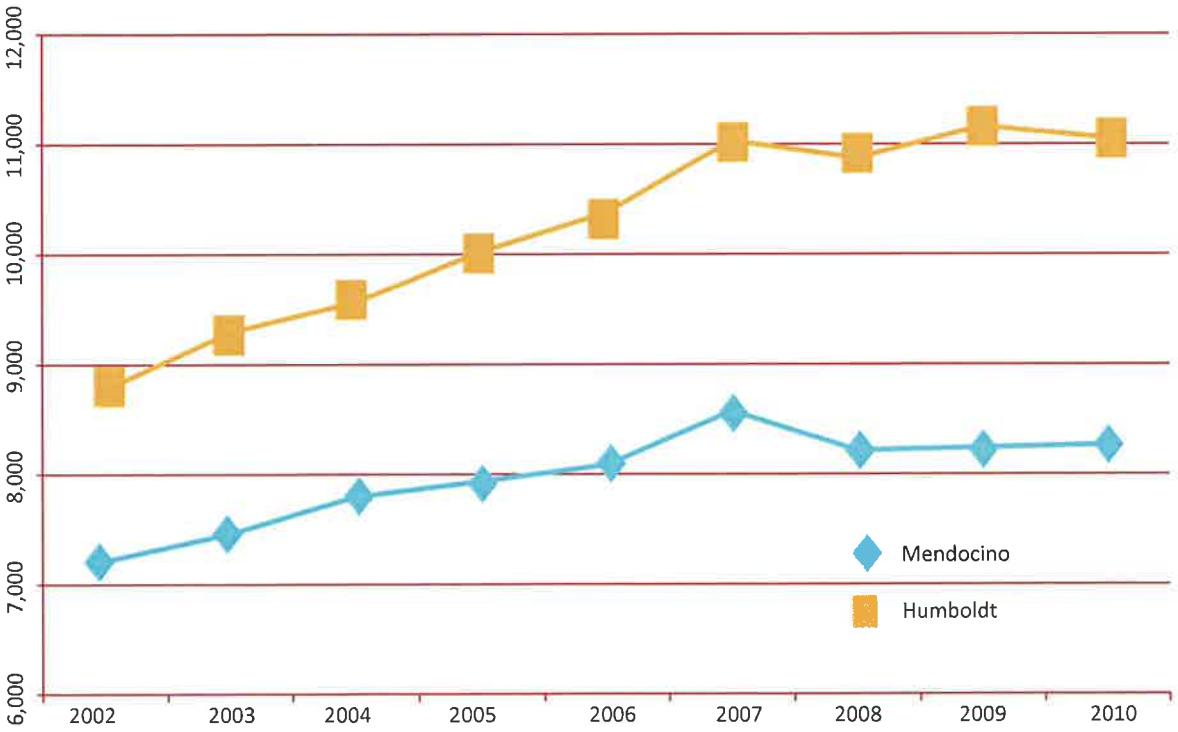
New firm creation data indicates that the Redwood Coast region demonstrates strong entrepreneurship capacity. In fact, Humboldt County, and to a lesser extent Mendocino County, appear to be experiencing an entrepreneurship boom since the recession. New Humboldt firms dropped off 1.4% following 2007, but immediately recovered surpassing pre-recession levels in both 2009 and 2010. And Mendocino has shown positive growth each year since the recession. From 2002-2010, Humboldt County saw a net increase of 2,283 new firms (26%), and Mendocino added 1,066 new firms.

For example, Cypress Grove Chevre founder Mary Keehn started her business as a single mother of four carrying goat's milk in her old Volvo station wagon and cheese in her purse. Today, Cypress Grove distributes 98% of their cheese throughout North America and provides over 40 benefitted jobs to region residents.

Tom Perrett began Tomas Jewelry over 30 years ago by importing jewelry from Asia and traveling to sell it at festivals. Today he exports 99% of his products out of the region and employs over 100 people.

Many self-employment, or owner-operated firms have the potential to become large employers, which is why new firm creation is considered an *indicator* of a region's entrepreneurship *capacity.* New firms are primarily being generated in the Target industries, so the Redwood Coast region's entrepreneurship capacity underscores the future opportunity in these industries. The table below demonstrates the positive trend in new firm creation.

Figure 1-3: Mendocino - Humboldt Self Employment Firms (no employees), 2002 - 2010



II. Target Industry Cluster Profiles

The following industry cluster profiles provide data on the changes in employment, firms, wages and the concentration of jobs for each Target Industry cluster from 1995-2009. This section of the report also includes narrative analysis of the data, industry leader perspectives, demand occupation tables and strategic work plans for each industry.

The demand occupation tables are included to help more clearly define the jobs offered in the Target Clusters. They also provide valuable planning information for employers, training institutions and private individuals assessing and/or analyzing their career options.

From five to twenty-five industry leaders, primarily from Humboldt County, participated in two to five cluster meetings in 2010 through 2012 to develop work plans for each Target industry, with regional input provided by Redwood Coast Rural Action. Business owners and executives worked together to identify opportunities and challenges as well as strategic activities that they believe will strengthen their industries. They also discussed the region's assets for their industry, key challenges and quick wins. Several economic development professionals from the Prosperity Network convened and facilitated these meetings and wrote the industry cluster work plans based on these discussions among industry leaders. Each work plan reflects the character of the cluster and the facilitator and has received industry concurrence.

It is an important distinction to note that the work plans describe what each industry sees as strategically important to do *for itself*. While some include projects, policies or programs that encompass more general economic development initiatives, building a list of projects for economic development was not the purpose of the work plans. Additionally, the methods used to accomplish these industry goals were not always identified or defined. More importantly, these work plans capture the voice and priorities of each industry and function as a valuable information source from which economic and workforce development professionals can craft projects, policies and programs that support job creation and entrepreneurship in the Target industries.

INDUSTRY PROFILE: Diversified Health Care

Figure 2-1: Diversified Health Care Performance Summary

Diversified Health Care	1995	2009	Percent Change, 1995 to 2009	Regional Comparison
Employment	9964	11810	18.5%	-6.1%
Firms	857	801	-6.5%	-15.5%
Wages	$31,945	$38,402	20.2%	6.7%
Concentration	1.29	1.30	0.8%	N/A

The Diversified Health Care industry cluster includes a wide range of health care options and support sectors. While traditional hospital-centered health care sectors have grown, they have been supplemented by an expanding diversity of options such as outpatient care centers, home and residential health care services and alternative care centers and providers.

Diversified Health Care is the largest of the Targets of Opportunity, comprising 11,810 jobs in the five-county region in 2009. The cluster increased jobs by 18.5%, which was substantially higher than the 6.1% loss experienced by the region as a whole.

This Target pays an average wage that is over 29% higher than the regional average of $29,794. Real wages also grew at a much faster rate than the regional average. Diversified Health Care firms also decreased by only 6.5%, which was much lower than the overall region's decline of 15.5%.

Overall, Diversified Health Care is almost one and a third times more concentrated in the Redwood Coast region than in California as a whole. The region has essentially maintained this advantage during the 1995-2009 period, increasing from 1.29 to 1.30. Although the cluster experienced little change in concentration compared to the California average during the study period, some sectors rose substantially. A diverse mix of sectors such as home health care services, other residential care facilities and individual and family services all grew faster than their counterparts in the rest of California.

Examples: Redwood Coast businesses that fall under the category of Diversified Health Care

ST. JOSEPH HEALTH SYSTEM

Salubria Wellness

HUMBOLDT HERBALS

UKIAH HEALTH CARE Skilled Nursing & Rehabilitation

MCDH Mendocino Coast District Hospital

America's Choice in Homecare Visiting Angels

A closer look at the industry groups comprising Diversified Health Care (see Fig. 2-2) reveals that:

- The biggest employers remain established health care providers consisting of general medical and surgical hospitals and physician offices. These sectors pay average wages that are much higher than the regional average of $29,794.
- Other sizable, growing sectors include a diverse mix of health care options like home health care services, other ambulatory health care services, elderly community care facilities, other residential care facilities, and individual and family services. These sectors do pay less than the regional average wage, but with the exception of home health care services, all sectors increased average wages between 1995 and 2009.

Figure 2-2: Diversified Health Care Performance Detail

NAICS Code	Industry Sector (NAICS Title)	Regional Average Employment		Annual Average Growth Rate	Average Annual Wage ($ECI ADJ)	Average Annual Wage	Total Establishments			Regional Employment Concentration	
		1995	2009		1995	2009	1995	2009	% Change	1995	2009
6211	Offices of Physicians	1831	1812	-0.1%	$41,361	$50,035	235	214	-8.9%	1.15	1.16
6212	Offices of Dentists	729	714	-0.1%	$32,590	$38,523	139	130	-6.5%	1.07	0.95
6213 6214	Outpatient Care Centers & Other Health Practitioners	1029	1038	0.1%	$30,855	$32,702	172	130	-24.4%	1.58	1.27
6215	Medical & Diagnostic Laboratories	34	35	0.2%	$78,315	$42,107	10	7	-30.0%	0.24	0.19
6216	Home Health Care Services	211	479	4.9%	$31,093	$23,794	11	15	36.4%	0.73	1.18
6219	Other Ambulatory Health Care Services	237	337	2.1%	$25,093	$31,415	14	15	7.1%	2.00	2.08
6221	General Medical and Surgical Hospitals	3083	3640	1.0%	$37,767	$53,216	14	14	0.0%	1.38	1.38
6231	Nursing Care Facilities	810	752	-0.4%	$23,884	$27,231	15	13	-13.3%	1.12	0.95
6233	Community Care Facilities for the Elderly	266	444	3.1%	$16,094	$21,184	49	33	-32.7%	0.88	1.00
6239	Other Residential Care Facilities	189	342	3.6%	$23,139	$23,355	4	11	175.0%	1.72	3.12
6241	Individual and Family Services	638	1410	4.8%	$19,682	$21,244	59	96	62.7%	1.58	2.08
6242	Community Food and Housing, & Emergency & Other Related Services	169	224	1.7%	$18,589	$22,695	27	26	-3.7%	1.94	2.15
6244	Child Day Care Services	738	583	-1.4%	$15,935	$19,447	108	97	-10.2%	1.95	1.42

Industry Drivers and Opportunities in Diversified Health Care

Health care is a social infrastructure for the community, which distinguishes it from most industries. As such, the accessibility and quality of healthcare in a region affects the rest of the economy, particularly in attracting and retaining talented employees and retirees. The funding for health care does not follow the same open market principles of other sectors such as Manufacturing. Public and private grant funding, charitable giving, religious institutions, private pay and insurance reimbursement dramatically change the structure, culture and drivers of the industry.

National and state policy for health care, insurance companies and changing technology drive the health care industry across the country, but the isolation of the Redwood Coast creates additional challenges. The region experiences lower reimbursement rates and a more limited number of insurance options for residents than many other areas. Challenges in attracting, retaining and training workforce for the industry in this rural region adds inefficiencies, increases costs and limits competitive opportunities. At the same time, demand for such service is inelastic and critical, requiring a base level of employment within the region. Poverty and remote living present additional challenges for the industry. This is partially managed by community health clinics that offer limited services to low-income patients. Multiple Native American tribes and a large regional population of tribal members have resulted in specialized care centers for tribal members as well.

Telemedicine presents opportunities for increasing regional "exports" of medical expertise to patients outside the region and expands practitioner choice for residents seeking care from experts outside the region. Expanding training facilities and programs within the region will address workforce shortages and increase exports of education.

Residents of the Redwood Coast region exhibit significant interest in alternative health care approaches and consumer demand drives entrepreneurial growth of these providers, who generally operate outside of the hospital, doctor's office and insurance company system. As a result, this industry is referred to as "Diversified Health Care". Greater networking of providers to share efficacy information and referrals throughout the Redwood Coast region will surface opportunities and projects for this cluster.

Diversified Health Care Strategic Work Plan

This industry cluster strategic work plan has been derived from a substantial effort to understand and characterize the industry opportunities and constraints as described in the report prepared by the California Center for Rural Policy at Humboldt State University for the Humboldt County Workforce Investment Board entitled "Strategic Work Plan for Education Needs, Health Information Technology, Recruitment and Retention for the Diversified Health Care Industry Cluster." Industry leaders throughout the Redwood Coast region contributed to the plan, though Humboldt County leaders had a disproportionate impact. A Guide to Acronyms is included in Appendix I.

Key Issues

A) Physician recruitment and retention to fill shortages in a rural region that does not have a sufficient population base to support local specialists in many healthcare fields

B) Workforce shortages in healthcare are increasing

C) A disconnect exists within the industry cluster between complementary and alternative medicine (CAM) and conventional medicine of hospitals and licensed physician's practices

D) Strategic, cross cluster linkages for planning and development could benefit this industry, tap expertise and benefit other clusters in the region

E) The impending demands of the Baby Boomer generation affect the industry

F) The federal government debate on healthcare reform has caused uncertainty

G) Our rural isolation and persistent poverty create both greater urgency and challenge

H) Rural areas also tend to have a high % of uninsured patients.

Assets

A) Humboldt State University health and kinesiology programs, with expertise such as sensing and robotics

B) College of the Redwoods nursing and health care occupations programs

C) Mendocino College health care training programs

D) California Center for Rural Policy at Humboldt State University

E) California Endowment, a local program officer and the foundation's dedication of resources to Del Norte County and Redwood Coast Native American Tribes

F) Humboldt - Del Norte Independent Practice Association (IPA) and their Primary Care Renewal Collaborative

G) Telehealth/telemedicine center

H) The wide array and quality of complementary and alternative medicine practitioners

I) Humboldt Regional Simulation Center

Quick Wins

A) Professional Resume Exchange

B) Secure funding for rural health care models

C) Establish health care business management courses

Strategy A

Build Local Pipeline of Workers to Address Allied Health Workforce Shortages. Create Health Care Career Educational Highways that Begin in the High Schools And Continue Through Articulated Programs at College of the Redwoods (CR) and Humboldt State University (HSU).

Project 1A. Convene Diversified Health Care Industry (DHCI) Roadmap task force (TF) & form working groups

a) Leaders recruit other stakeholders to TF (e.g., NoRTEC, SBDC, students)

b) Develop roles and charge for TF and their work related to strategic plan

c) Select TF co-chairs and set meeting schedule

d) Determine appropriate Occupational Working Groups & membership

e) Form Career Technical Preparation Working Group [or enlist Pre-college Career Technical Advisory Committee] that will advise on development of curriculum and experiences for career preparation for middle and high school students, pertaining to DHC occupations

Project 2A. Identify and prioritize occupations in order to identify which DHCI career highways to develop

a) Launch web survey to determine what the highest needs are for DHCI training

b) Analyze and interpret results, projecting the numbers of qualified graduates needed at "destinations", i.e., trained workers ready to enter the workforce. In particular, target training and education for youth and adults in low-income populations and underserved tribal and Latino communities (see Projects 10 and 11).

c) Prioritize DHCI career highways to be built or improved, based on "most travelled" educational routes relative to numbers of projected students on highways--also consider "highest need" educational routes that target low-income and tribal or Latino populations

d) Develop schedule for highway building (e.g., some highways built in Year 1, Year 2, etc.)

Project 3A. Develop articulation agreements for each DHCI career highway

a) For math- or science-based occupations, work 'backwards' from certification requirements to determine math and science prerequisites at all levels (college, high school, junior high/middle school)

b) Identify, integrate and map existing experiential and volunteer opportunities and internship placements ("bike lanes"?) that enhance the career highways, e.g., Open Door Teen Health Clinics, Spare Change, Planned Parenthood, Youth Experiences in Careers. Also include the potential for a teaching health clinic (HRSA planning grant) as part of the internship possibilities. See also Project 11.

c) Identify and include the generic basic job skills (with accompanying assessments) in areas like Communication, Problem Solving, and Interpersonal (Teamwork) – possibly Work Keys (ACT) curriculum

d) Create a DHCI map and legend for the career highways

e) Identify needs for "on-ramps" & "bridge" programs to help increase & retain (ensure success of) the numbers of students travelling the DHC highways (see Projects 10 and 11)

Project 4A. Identify appropriate career or personality aptitude assessments and connect assessment outcomes to relevant DHCI career highways

a) Identify, link and interface aptitude assessments (Kuder Navigator used by HCOE, DNCOE, Mendocino High School) to Career Pathway Roadmap Webtool

b) Obtain input from and validate with Occupational Working Groups.

Project 5A. Develop a user's guide on how to use the maps for students and guidance counselors

a) Add aptitude outcomes as first step in using the map

b) Develop booklet

c) Develop interactive website based on users guide

d) Add videos of real persons employed in various careers to website

Project 6A. Disseminate information about the DHCI maps

a) Develop communication plan for DHCI maps and users guide

b) Develop ad campaign, brochures and presentation

c) Recruit Speakers Bureau members

d) Put on training for Speakers Bureau

Project 7A. Plan and implement DHCI Careers Exploration Fair/ Days for the region

a) Recruit guidance counselors & Regional Occupations Program key personnel to convene and serve on DHCI Careers Exploration Working Group

b) Career Fair Working Group plans formats for how DHCI careers will be rolled out in each county

c) Orient guidance counselors in the region from middle school through college and employment centers to the DHCI maps

Project 8A. Plan and pilot High School Career Coaching Program (2 high schools?) (a la carte menu option targeting low-income, Tribal & Latino student and workforce populations)

a) Select high schools that will participate in pre-college career coaching program

b) Develop work plan for program implementation and evaluation

c) Determine funding sources and/or apply for grant funding

d) Hire program coordinator and career coaches

e) Conduct training

f) Market coaching services

g) Implement program

h) Collect evaluation data and assess program success

i) Determine if program should be sustained and further disseminated in region

Project 9A. Plan and pilot Education Navigators Program for low-income, Tribal and/or Latino populations (a la carte menu option targeting HS students and adult learners seeking career change)

a) Select appropriate department/person at CR to oversee Education Navigators Program

b) Develop work plan for program implementation and evaluation, which includes how CR Education Navigator program interfaces with HSU's programs

c) Determine funding sources and/or apply for grant funding

d) Hire program coordinator and education navigators (with target populations in mind)

e) Conduct training

f) Market navigation services

g) Implement program

h) Collect evaluation data and assess program success

i) Determine if program should be sustained

Project 10A. Explore experiential programs to provide underrepresented students with hands-on experience in diversified health care occupations

a) Select appropriate programs, host agencies and CBO's to partner and oversee proposed experiential programs. Excellent candidate: Youth Health Service Corps developed by AHEC.

b) Develop work plan for program implementation and evaluation, which includes how experiential programs align with the DHC career highways that are mapped

c) Determine funding sources and/or apply for grant funding

d) Hire program coordinators and staff (with target populations in mind)

e) Conduct training

f) Market program services

g) Implement programs

h) Collect evaluation data and assess program success

i) Determine if program should be sustained

Project 11A. Pilot "health literacy across the curriculum" in K-12 educational settings to best prepare all students at the beginning of the career educational highways

a) Research health literacy curricula appropriate for K-12 and models for curriculum infusion

b) Identify schools interested in piloting curriculum

c) School partnership develops work plan for health literacy lessons that can be delivered in classroom setting using current resources, including older peer mentors who are already engaged in DHC education or engaged as participants in youth experiential programs (see #11)

d) Determine funding sources and/or apply for grant funding

e) Hire program coordinators and staff (with target populations in mind)

f) Conduct training

g) Curriculum delivered

h) Collect evaluation data and assess program success

i) Determine if program should be sustained

Strategy B

Apply Best Practices to Recruiting And Retaining Health Care Professionals Needed in the Region.

Project 1B. Develop one or more first rate recruitment website(s) that are appealing to young health care professionals

a) Research model website designs

b) Find funding for website(s)

c) Create an RFP for development and maintenance

Education-Based Projects—Also see Strategy 1: Need to increase incentives for local youth to seek training in other communities and return to work in our region

Project 2B. Provide additional funding support for local candidates for in-area and out-of-area training

Project 3B. Establish relationships with training programs that have a rural tracks

Project 4B. Explore additional distance learning opportunities to help entry level employees get higher level instruction

Project 5B. Apply for grant funding opportunities to get low-income and minorities into training programs

Project 6B. Improve access to residency programs—especially those with rural tracks

Project 7B. Research creating a "teaching clinic"

Strategy C

Maintain Public Funding for low-income Patients and Secure Grant Funding to Increase Financial Security for Health Care Small Businesses

Project 1C. Maintain HSPA/MUA/MUP shortage area designation, so that physicians can receive additional revenue for seeing low-income patients

Project 2C. Support Electronic Medical Records adoption

Project 3C. Assess sub-county eligibility for mental, dental & primary care shortage area designations, and submit applications where eligible

Project 4C. Monitor shortage area designation rulemaking
a) Assess impact of proposed changes on region
b) Share findings
c) Make advocacy recommendations

Project 5C. Maintain an updated list of current providers and actual FTE

Project 6C. Maintain Regional Workforce Comparison charts for physicians and specialists

Project 7C. Maintain Medi-Cal utilization and low-income Comparison

Strategy D

Improve Working Conditions for the Rural Health Care Workforce, Especially Those Who Are Part of Small Businesses

Project 1D. Look for opportunities to share specialists regionally through telemedicine

Project 2D. Research telemedicine expansion opportunities

Project 3D. Integration of the spouses that follow medical practitioners

Project 4D. Increase interaction between new health care workforce members and the community
a) Welcome Wagon
b) Receptions/Mixers
c) Welcome listing in the newspaper

Project 5D. Connect providers and their families to other community resources
a) Tours of region
b) Invitations to local events

Project 6D. Plan for spouse support, community integration, collegial support and peer mentoring

Project 7D. Conduct Exit Surveys when health professionals leave the community

Strategy E

Train a Local Workforce in Health Care IT Design and Implementation

Project 1E. Create a Occupational Working Group for Health IT

Project 2E. Look at existing classes in CIS and Health Occupations and align the content to create a "new workforce" education program

Project 3E. Use regional HITS resource center (federally designated center for curriculum and faculty training)

Project 4E. Certificates and/or degrees developed and submitted for approval to the California Community College Chancellor's office

Project 5E. Work with College of the Redwoods to design courses and programs that lead to proficiency in software, hardware and system design needed in health care IT

Strategy F

Increase Opportunities for Information Exchange Among Practitioners in the Region

Project 1F. Develop the scope of potential information exchange including: health care providers, hospitals, skilled nursing facilities, County Public Health, County Mental Health and others

Project 2F. Community inventory of practices, information providers (clinical labs, etc.), and existing information exchanges

Project 3F. Analyze inventory, assess readiness to participate in HIE. Identify EHR products in use, potential to adopt EHRs, and interest in HIE

Project 4F. Investigate community models of HIE and community governance of HIE

Project 5F. Develop community consensus on HIE model

Project 6F. Using the model, develop priorities based on patient impact, "meaningful use", availability of exchange partners, technology, cost, willingness to participate and availability of funds

a) Integrate Health Information Technology Assessments of small and Critical Access Hospitals (Southern Humboldt, Mountain Community Medical Services)

Project 7F. Survey federal, state activities to coordinate with their HIE activities

a) Coordinate with Cal eConnect, Cal X, and others

Project 8F. Develop a business model and fund activities

Project 9F. Develop patient, provider, and community consensus on privacy regulations consistent with state and federal regulations

a) Train and monitor HIE users on privacy regulations; communicate community consensus

Project 10F. Build out the HIE based on model, priorities and funds, construct data warehouse and maintain

Project 11F. Provide meaningful use support, including quality reporting and disease registries

Project 12F. As regulation permits, construct gateway to National Health Information Network (NHIN)

Jobs in the Diversified Health Care Industry Cluster

Diversified Health Care offers ample employment opportunities across all wage levels. Through 2018, almost two thousand (1,982) jobs are projected to open annually. With large and growing occupations at all wage levels, many jobs in Diversified Health Care provide strong caree r potential. 21% of the industry occupations are in the higher wage level, 30% in the mid-wage level and 49% in the lower wage level. Higher and mid-wage careers can be entered with an Associates and Bachelor's degree (see table: Occupational Employment Projections).

Figure 2-3: Diversified Health Care 2008-2018 Occupational Employment Projections

The following table indicates the distribution of high, mid & low wage jobs projected for Diversified Health Care from 2008 to 2018.

Wage Ranges	
Higher Wage	21%
Mid-Range Wage	30%
Lower Wage	49%

SOC Code	Occupation Title	Annual Average Employment		Employment Change (%)	Avg Annual Job Openings (by # of jobs)[1]	2010 Wages, Median Annual[2]	Education and Training Levels[3]
		2008	2018				
21-1013	Marriage-Family Therapists	40	40	0.0	1	$155,836	3
29-1062	Family-General Practitioners	50	60	20.0	1	$144,646	1
29-1051	Pharmacists	240	280	16.7	8	$126,695	1
29-1021	Dentists, General	180	170	-5.6	5	$108,608	1
11-2021	Marketing Managers	30	40	33.3	1	$105,352	4
11-1011	Chief Executives	280	270	-3.6	8	$105,327	4
11-9199	Managers, All Other	290	300	3.4	8	$96,785	8
29-2021	Dental Hygienists	130	150	15.4	5	$91,881	6
29-1071	Physician Assistants	60	80	33.3	2	$90,707	5
19-3031	Clinical Counseling Pyschologists	130	130	0.0	4	$86,213	2
11-9111	Medical & Health Services Managers	300	320	6.7	8	$81,713	4
29-1123	Physical Therapists	80	100	25.0	3	$79,339	3
29-1041	Optometrists	40	40	0.0	1	$77,076	1
11-3021	Computer, Info Systems Mgrs	60	60	0.0	1	$76,218	4
11-1021	General, Operations Mgrs	1,390	1,390	0.0	40	$76,125	4
15-1031	Computer Software Engrs, Appl's	60	80	33.3	3	$75,180	5
29-1111	Registered Nurses	1,650	1,910	15.8	55	$72,083	6
13-2051	Financial Analysts	50	60	20.0	2	$71,334	5
11-2022	Sales Managers	260	310	19.2	11	$70,804	4
41-4011	Sales , Manf, Tech, Scientific Prods	70	80	14.3	3	$70,423	10

The following table indicates the distribution of high, mid & low wage jobs projected for Diversified Health Care from 2008 to 2018.

Wage Ranges	
Higher Wage	21%
Mid-Range Wage	30%
Lower Wage	49%

SOC Code	Occupation Title	Annual Average Employment		Employment Change (%)	Avg Annual Job Openings (by # of jobs)[1]	2010 Wages, Median Annual[2]	Education and Training Levels[3]
		2008	2018				
11-3041	Compensation, Benefits Mgers	30	30	0.0	1	$70,096	4
29-2011	Medical, Clinical Lab Techs	50	50	0.0	1	$69,917	5
19-1042	Med Scientists, Not Epidemiologists	40	50	25.0	2	$69,041	2
15-1051	Comp Systems Analysts	90	100	11.1	3	$68,688	5
25-2041	Spec Ed Teachers, Elementary School	190	200	5.3	7	$68,342	5
11-3031	Financial Managers	330	360	9.1	8	$68,070	4
29-1127	Speech-Language Pathologists	60	60	0.0	1	$66,973	3
29-1126	Respiratory Therapists	80	90	12.5	3	$64,196	6
13-1031	Claims Adj Investigators	60	60	0.0	2	$63,007	9
25-9031	Instructional Coordinators	200	220	10.0	6	$62,863	3
29-9099	Healthcare Practitioners, Techs	40	40	0.0	1	$61,765	7
29-2034	Radio Technologists, Technicians	140	150	7.1	3	$61,068	6
51-1011	Line Sups/Mgrs Operating Workers	280	280	0.0	4	$59,171	8
11-3061	Purchasing Managers	40	40	0.0	1	$58,581	4
13-2031	Budget Analysts	40	50	25.0	1	$58,214	5
11-2031	Public Relations Managers	30	30	0.0	1	$57,955	4
15-1061	Database Administrators	40	40	0.0	1	$57,707	5
29-1031	Dietitians & Nutritionists	40	40	0.0	1	$56,089	5
25-2012	Kind. Teach, except Spec Ed	280	300	7.1	8	$55,917	5
47-2111	Electricians	180	190	5.6	5	$55,912	9
49-1011	Line Sups, Mgrs Mechs	260	270	3.8	8	$55,330	8
15-1081	Network Syst, Data Comm. Analysts	110	160	45.5	7	$54,172	5
41-1012	Line Sups/Mgrs, Non-Retail Sales	180	190	5.6	5	$53,686	8
21-1014	Mental Health Counselors	240	260	8.3	7	$53,011	3
13-1111	Management Analysts	540	620	14.8	17	$52,391	4
21-1012	Ed, Voc, & School Counselors	310	330	6.5	7	$51,640	3

The following table indicates the distribution of high, mid & low wage jobs projected for Diversified Health Care from 2008 to 2018.

Wage Ranges	
Higher Wage	21%
Mid-Range Wage	30%
Lower Wage	49%

SOC Code	Occupation Title	Annual Average Employment		Employment Change (%)	Avg Annual Job Openings (by # of jobs)[1]	2010 Wages, Median Annual[2]	Education and Training Levels[3]
		2008	2018				
15-1071	Network, Comp Systems Admin.	130	140	7.7	3	$50,768	5
25-3099	Teachers & Instructors	650	690	6.2	14	$50,309	5
13-2011	Accountants & Auditors	530	610	15.1	17	$50,289	5
31-2021	Physical Therapist Assistants	50	60	20.0	2	$50,116	6
11-3011	Admin Svs Managers	190	190	0.0	4	$49,964	4
53-1031	Line Sups/Mgrs-Trans Operators	120	110	-8.3	2	$49,885	8
29-2061	Lic. Practical, Lic. Vocational Nurses	390	420	7.7	15	$49,713	7
13-1079	HR., Labor Relation Specialists	60	70	16.7	3	$49,496	5
13-1073	Training & Dev Spec	80	90	12.5	3	$49,416	5
13-1072	Comp Bene's, Job Specialists	50	60	20.0	2	$49,017	5
47-2152	Plumbers, Steamfitters	310	340	9.7	9	$48,582	9
21-1022	Med. Public Health Social Workers	100	110	10.0	3	$48,389	5
13-1023	Buyers, not Wholesale, Retail	90	100	11.1	3	$47,739	5
29-2055	Surgical Technologists	50	60	20.0	2	$47,680	7
19-3021	Market Research	70	80	14.3	4	$47,520	3
13-1071	Employment, Recruitmt, Specialists	50	60	20.0	2	$47,059	5
21-1023	Ment. Health, Sub Abuse Workers	180	180	0.0	5	$46,784	3
47-2031	Carpenters	1,120	1,170	4.5	20	$46,496	9
33-1099	Line Sups/Mgrs, Protective Workers	70	70	0.0	3	$45,871	8
41-3099	Sales Reps, Services	130	140	7.7	5	$45,626	10
13-1041	Compl. Officers, not Agric, Const, Health	150	180	20.0	5	$45,528	9
				TOTAL # JOBS	407		
11-9151	Social & Community Service Managers	250	270	8.0	8	$44,972	5
13-1199	Business Ops Specialists	770	820	6.5	22	$43,727	5
11-9051	Food Service Managers	400	400	0.0	8	$43,379	8

The following table indicates the distribution of high, mid & low wage jobs projected for Diversified Health Care from 2008 to 2018.

Wage Ranges	
Higher Wage	21%
Mid-Range Wage	30%
Lower Wage	49%

SOC Code	Occupation Title	Annual Average Employment		Employment Change (%)	Avg Annual Job Openings (by # of jobs)[1]	2010 Wages, Median Annual[2]	Education and Training Levels[3]
		2008	2018				
43-1011	Office-Admin Workers	1,160	1,240	6.9	34	$42,994	8
41-9099	Sales, Related Workers	110	140	27.3	6	$42,544	10
19-4099	Life, Physical, Social Science Techs	60	60	0.0	3	$42,363	6
53-3099	Motor Vehicle Operators, All Other	60	60	0.0	1	$41,852	11
43-5031	Emergency Dispatchers	100	100	0.0	3	$41,556	10
43-5061	Planning Clerks	80	90	12.5	3	$41,505	11
21-1091	Health Educators	110	110	0.0	2	$40,897	3
47-2141	Painters, Maintenance	430	430	0.0	7	$40,477	10
21-1021	Child, Family Social Workers	600	600	0.0	15	$40,188	5
15-1021	Computer Programmers	50	50	0.0	1	$39,384	5
49-9021	Heating, Air Mechanics	50	50	0.0	2	$39,032	9
49-3023	Auto Service Techs	560	630	12.5	18	$38,659	7
11-9031	Educ, Preschool, Child Care Program	170	170	0.0	5	$38,464	4
21-1011	Sub Abuse, Behav Disorder Cnsls	140	150	7.1	3	$38,116	3
51-9081	Dental Laboratory Technicians	70	80	14.3	1	$37,791	9
43-6011	Exec Secs., Admin Assistants	1,060	1,130	6.6	22	$36,768	10
29-2012	Medical Clinical Lab Techs	80	80	0.0	3	$36,251	6
43-3061	Procurement Clerks	80	90	12.5	3	$36,137	11
43-4161	HR Assistants, Except Payroll	130	110	-15.4	4	$36,131	11
15-1041	Computer Support Specialists	250	260	4.0	8	$36,078	6
27-1024	Graphic Designers	130	140	7.7	5	$36,042	5
43-3011	Bill-Account Collectors	110	130	18.2	4	$36,030	11
43-9041	Insurance Claims-Policy Proc Clerks	120	120	0.0	2	$36,003	10
33-9099	Protective Service Workers, All Other	320	310	-3.1	22	$35,881	11
43-9011	Computer Operators	70	50	-28.6	1	$35,779	10
37-1011	Managers Hskpg Workers	230	220	-4.3	2	$35,728	8
29-2099	Health Techs- Technologists	90	100	11.1	3	$35,583	7
31-9094	Medical Transcriptionists	60	60	0.0	1	$35,330	7

The following table indicates the distribution of high, mid & low wage jobs projected for Diversified Health Care from 2008 to 2018.

Wage Ranges	
Higher Wage	21%
Mid-Range Wage	30%
Lower Wage	49%

SOC Code	Occupation Title	Annual Average Employment		Employment Change (%)	Avg Annual Job Openings (by # of jobs)[1]	2010 Wages, Median Annual[2]	Education and Training Levels[3]
		2008	2018				
29-2052	Pharmacy Technicians	260	330	26.9	14	$34,900	10
31-9099	Healthcare Support Workers, All Other	150	160	6.7	3	$34,304	11
43-3051	Payroll & Timekeeping Clerks	280	250	-10.7	7	$34,042	10
47-2061	Construction Laborers	1,070	1,190	11.2	19	$33,493	10
11-9081	Lodging Managers	180	190	5.6	5	$33,454	8
43-3031	Bookkeeping, Auditing Clerks	2,000	2,130	6.5	37	$33,420	10
11-9141	Property, Comm. Assoc Managers	420	440	4.8	9	$33,236	5
53-3022	Bus Drivers, School	210	200	-4.8	4	$32,880	11
31-9091	Dental Assistants	380	430	13.2	12	$32,677	10
43-4111	Interviewers, not Eligibility	180	200	11.1	7	$32,134	11
53-3033	Truck Drivers, Light or Delivery Services	650	740	13.8	20	$31,859	11
43-9022	Word Processors & Typists	70	60	-14.3	1	$31,779	10
35-1011	Chefs & Head Cooks	100	100	0.0	1	$31,099	7
19-4021	Biological Technicians	70	70	0.0	3	$31,059	6
49-9042	Maintenance, Repair Workers	1,190	1,290	8.4	28	$30,717	9
37-3011	Landscaping Workers	1,680	1,840	9.5	36	$30,279	11
31-9092	Medical Assistants	690	800	15.9	19	$30,230	10
43-3021	Billing, Posting Clerks	390	410	5.1	8	$29,969	10
43-6013	Medical Secretaries	680	750	10.3	16	$29,938	7
29-2081	Opticians, Dispensing	30	30	0.0	1	$29,901	9
21-1015	Rehabilitation Counselors	220	250	13.6	8	$29,509	3
43-9199	Administrative Support Workers	90	70	-22.2	2	$29,358	10
43-6014	Secretaries	990	960	-3.0	13	$29,218	10
29-2071	Med Records, Health Info Techs	160	170	6.3	5	$29,059	6
25-2011	Preschool Teachers, Except Spec Ed	250	260	4.0	7	$28,718	7

The following table indicates the distribution of high, mid & low wage jobs projected for Diversified Health Care from 2008 to 2018.

Wage Ranges	
Higher Wage	21%
Mid-Range Wage	30%
Lower Wage	49%

SOC Code	Occupation Title	Annual Average Employment		Employment Change (%)	Avg Annual Job Openings (by # of jobs)[1]	2010 Wages, Median Annual[2]	Education and Training Levels[3]
		2008	2018				
21-1093	Social & Human Service Assistants	560	630	12.5	19	$26,450	10
43-9061	Office Clerks, General	2,150	2,240	4.2	38	$26,281	11
43-5071	Shipping, Receiving, & Traffic Clerks	460	440	-4.3	11	$26,246	11
27-3031	Public Relations Specialists	100	120	20.0	4	$26,187	5
39-5012	Hairdressers, Hairstylists	260	310	19.2	9	$26,120	7
43-9021	Data Entry Keyers	70	50	-28.6	1	$25,741	10
35-2012	Cooks, Institution & Cafeteria	310	300	-3.2	8	$25,706	10
27-3091	Interpreters & Translators	70	80	14.3	3	$25,368	9
31-2022	Physical Therapist Aides	50	60	20.0	2	$25,057	11
				TOTAL # JOBS	602		
43-4171	Receptionists & Information Clerks	700	740	5.7	23	$24,997	11
37-2011	Janitors, Cleaners, except Maids	1,350	1,300	-3.7	26	$24,921	11
43-5032	Dispatchers, not Police, Fire, Ambulance	100	100	0.0	2	$24,571	10
53-7062	Laborers, Freight, Material Movers	1,010	1,060	5.0	37	$24,550	11
35-1012	Managers-Food Prep Workers	740	770	4.1	10	$24,526	8
31-9011	Massage Therapists	170	180	5.9	3	$24,511	7
29-2041	Emergency Med Techs Paramedics	200	180	-10.0	4	$24,000	7
25-9041	Teacher Assistants	2,090	2,090	0.0	45	$22,837	11
43-3071	Tellers	640	680	6.3	30	$22,747	11
31-1012	N-Aides, Orderlies, Attendants	660	710	7.6	13	$22,420	11
35-3041	Food Servers, Non-Restaurant	70	70	0.0	1	$22,219	11
43-5081	Stock Clerks & Order Fillers	1,130	1,250	10.6	38	$21,935	11
39-9011	Child Care Workers	710	720	1.4	22	$21,868	11
39-9021	Personal & Home Care Aides	3,640	3,830	5.2	64	$21,516	11

The following table indicates the distribution of high, mid & low wage jobs projected for Diversified Health Care from 2008 to 2018.

Wage Ranges	
Higher Wage	21%
Mid-Range Wage	30%
Lower Wage	49%

SOC Code	Occupation Title	Annual Average Employment		Employment Change (%)	Avg Annual Job Openings (by # of jobs)[1]	2010 Wages, Median Annual[2]	Education and Training Levels[3]
		2008	2018				
41-2011	Cashiers	3,770	4,130	9.5	205	$20,902	11
41-2031	Retail Salespersons	3,580	4,220	17.9	164	$20,840	11
53-3041	Taxi Drivers & Chauffeurs	200	200	0.0	4	$20,838	11
33-9032	Security Guards	630	650	3.2	15	$20,588	11
35-3022	Counter Worker, Coffee Shop	620	660	6.5	50	$20,474	11
39-9032	Recreation Workers	590	590	0.0	11	$20,385	5
51-6011	Laundry & Dry-Cleaning Workers	70	70	0.0	1	$20,059	10
37-2012	Maids & Housekeeping	1,460	1,490	2.1	29	$19,877	11
31-1011	Home Health Aides	410	530	29.3	15	$19,674	11
35-3021	Combined Food Preparation	2,180	2,430	11.5	71	$19,090	11
35-2021	Food Preparation Workers	1,130	1,150	1.8	42	$19,047	11
35-9021	Dishwashers	620	650	4.8	28	$18,774	11
35-9011	Dining & Cafeteria Attendants	460	460	0.0	20	$18,209	11
				TOTAL # JOBS	973		

March 2009 Benchmark

Table includes the self-employed, unpaid family workers, private household workers, & farm employment. Occupations with employment below 30 in 2008 are excluded. Occupation subtotals may not add to the totals due to rounding & the suppression of data. N/A - Information is not available.

[1] Total Jobs are the sum of new jobs & replacement needs.

[2] Annual Wages are the estimated 50th percentile of the distribution of wages; 50% of workers in an occupation earn wages below, & 50% earn wages above the median wage. The wages are from 2010-1st quarter & do not include self-employed or unpaid family workers.

[3] Occupational training & education classifications were developed by the Bureau of Labor Statistics (BLS).

For more information on the classifications, please see the BLS Training Definitions.

1. First Professional Degree - LLD/MD
2. Doctoral Degree
3. Master's Degree
4. Bachelor's Degree or Higher & Some Work Experience
5. Bachelor's Degree
6. Associate Degree
7. Post-Secondary Vocational Education
8. Work Experience in a Related Occupation
9. Long term On-the-Job Training
10. Moderate Term On-the-Job Training
11. Short Term On-the-Job Training

INDUSTRY PROFILE: Specialty Food, Flowers and Beverages

Figure 2-4: Specialty Food, Flowers and Beverages Performance Summary

Specialty Food, Flowers & Beverages	1995	2009	Percent Change, 1995 to 2009	Regional Comparison
Employment	9800	9393	-4.2%	-6.1%
Firms	994	711	-28.5%	-15.5%
Wages	$23,948	$27,929	16.6%	6.7%
Concentration	1.32	1.38	4.5%	N/A

The Specialty Food, Flowers and Beverage industry cluster, commonly called Specialty Agriculture, is comprised of sectors focused on specialty products whose production method is frequently tied to the climate, grasslands, lifestyle and micro-climates of the Redwood Coast region, rather than bulk agricultural commodities that could be grown or produced in many other regions. These products include

- Specialty cheeses (dairy manufacturing)
- Specialty meats (grassfed and organic beef and lamb)
- Wine and beer (beverage manufacturing)
- Flowers (greenhouse, nursery and floriculture production)

The cluster also includes important front-end suppliers for these products (e.g., fruit and nut farming; support activities for crop production) and distribution channels (e.g., warehousing and storage; alcoholic beverage merchant wholesalers).

Specialty Food, Flowers and Beverage is the second largest of the Targets of Opportunity, employing 9,393 across the five county region in 2009. The cluster experienced marginally less job loss in comparison to the overall region over the period. Much of the cluster's job decline is attributable to lack of available water for crop irrigation for a specific crop in a single county (Siskiyou) within the five-county region. This county's loss of nearly half (-570) of its total farm jobs offset otherwise positive cluster growth during the period.

Examples: Redwood Coast businesses that fall under the category of Specialty Food, Flowers and Beverages

Specialty Food, Flowers and Beverages pays an average wage ($27,929) that is about 6.7 % lower than the regional average, but with substantial differences among sectors. Total cluster wages grew at a much faster rate (16.6%) than the overall region average of 6.7 %. In general, wages are lower among the front-end suppliers than the downstream manufacturing and distribution sectors. The bulk of this is due to the seasonal nature of crop and animal production. In reality, industry workers often work multiple seasonal jobs and experience substantially higher total annual wages than the average wage per job depicted within this data set. In spite of seasonality, the cluster's average wage is closing the gap when compared to the region—improving from 16.7 % to 6.7 % below the regional average over the 1995-2009 period.

Unfortunately, performance and job growth from firms in the Specialty Ag cluster is volatile. Front-end suppliers face a hazardous flux of potentially economically damaging conditions related to irrigation issues, increasing energy and transportation costs, wide-spread economic recession, regulations, and crop and animal pests and disease. When faced with the 2006-2007 economic downturn and escalating fuel costs, many of the cluster's small front-end suppliers restructured, reverting to family-run enterprises with no employees, which disqualified them from being counted among the firm data within this data set. While the cluster's firms declined 28.5%, which was more than the regional average decline (-15.5%), its concentration increased from 1.32 to 1.38, indicating the cluster became more competitive when compared to California as a whole.

A closer look at the industry groups comprising Specialty Agriculture, Food, and Beverage (see Fig. 2-5) reveals that:

- Agricultural crop and animal production and related manufacturing comprise over half the cluster's employment and fruit and tree nut farming and beverage manufacturing were the largest employers. While fruit and tree nut farming jobs reflect seasonal employment with less than regional average wages, wage growth (+14.8%) was more than double the regional average (+6.1%).
- The second largest employer, beverage manufacturing, pays substantially higher wages (+25%) than the regional average. The number of firms has also expanded from 45 in 1995 to 58 in 2009, an increase of almost 29%. This sector is nearly four times more concentrated in the Redwood Coast region than in the state as a whole.
- Dairy product manufacturing and animal processing has been a small but rapidly expanding sector, experiencing job growth of more than 32% between 1995 and 2009 and providing average wages that are nearly 50% higher than the regional average. Moreover, its regional concentration has jumped from a substandard position in 1995 to almost equal the state average by 2009.

Figure 2-5: Specialty Food, Flowers and Beverages Performance Detail

NAICS Code	Industry Sector (NAICS Title)	Regional Average Employment		Annual Average Growth Rate	Average Annual Wage ($ECI ADJ)	Average Annual Wage	Total Establishments			Regional Employment Concentration	
		1995	2009		1995	2009	1995	2009	% Change	1995	2009
1111 1112 1119	Grain, Vegetable, & Other Crop Farming	565	341	-3.1%	$17,225	$27,481	137	58	-57.7%	1.0	1.0
1113	Fruit and Tree Nut Farming	1305	1068	-1.2%	$16,687	$19,149	174	131	-24.7%	1.8	1.7
1114	Greenhouse, Nursery, and Floriculture Production	562	708	1.4%	$20,206	$27,101	32	24	-25.0%	2.1	3.8
1121 1124	Cattle, Sheep & Goat Ranching & Farming	507	477	-0.4%	$18,908	$24,878	216	118	-45.4%	3.4	3.0
1125	Animal Aquaculture	46	51	0.6%	$14,824	$20,149	7	8	14.3%	7.2	14.1
1151	Support Activities for Crop Production	602	432	-1.9%	$20,645	$23,934	23	20	-13.0%	0.5	0.4
3113 3119	Chocolate & Other Food Manufacturing	64	141	5.1%	$17,800	$19,331	8	12	50.0%	0.3	0.7
3115 3116	Dairy Products & Animal Processing	186	244	1.7%	$37,069	$44,667	10	6	-40.0%	0.7	0.9
3118	Bakeries and Tortilla Manufacturing	197	179	-0.6%	$26,103	$19,276	14	16	14.3%	0.6	0.7
3121	Beverage Manufacturing	1045	1102	0.3%	$32,387	$37,241	45	58	28.9%	4.6	3.8
3253	Pesticide, Fertilizer, and Other Agricultural Chemical	33	56	3.2%	$28,856	$82,274	4	4	0.0%	1.1	4.2
4244 4245 4931	Grocery & Farm Product Wholesalers & Warehous-ing	624	597	-0.3%	$32,178	$37,251	69	72	4.3%	0.6	0.5
4248	Beer, Wine, and Distilled Alcoholic Beverage Merchant	171	177	0.2%	$40,030	$57,661	11	9	-18.2%	1.8	1.5
4451 4452	Grocery & Specialty Food Stores	3893	3820	-0.1%	$24,207	$24,850	244	175	-28.3%	1.8	1.8

Industry Drivers and Opportunities in Specialty Food, Flowers and Beverages

Several consumer interests and trends drive the Specialty Food, Flowers and Beverages marketplace, including

- Desire for organic and/or artisanal products
- Distance to market
- Concern regarding humane treatment of animals
- Family farms
- Fear of disease
- Desire for unique flavors
- Lifestyle of the producer

Producers within the cluster are increasingly collaborating and developing new products to compete for discerning customers in urban areas. Those customers tend to associate Redwood Coast products with a positive lifestyle and their desire to share this lifestyle can prompt them to purchase products from the region.

Unfortunately, exporting goods out of the Redwood Coast region can be costly. Increased transportation costs can substantially increase wholesale and retail prices and limit local firms' ability to compete in the national market. These added costs likely dampen wages and job creation as well.

Regional collaborative efforts to understand and enter markets, share space, equipment, trucking costs, waste disposal have proven and will continue to be valuable to this cluster.

Strategic Work Plan for Specialty Food, Flowers and Beverages

Approximately twenty-five business owners in the industry, primarily located in Humboldt County, worked together to identify opportunities and challenges as well as strategic activities that will strengthen the Specialty Food, Flowers and Beverages industry. Two economic development practitioners—Angeline Schwab of Humboldt County Economic Development Division and Michael Kraft of North Coast Small Business Development Center—convened and facilitated the discussions and wrote up the work-plan.

Key Issues

A) Transportation

b) Common facilities, like commercial kitchens

Assets

A) Long growing season

B) Micro-climates

C) Quality of grasslands

D) Food culture of the region provides a discerning customer

Quick Wins

A) Determine sustainable capacity for cooperative commercial kitchen space, refrigeration, aggregation and distribution facilities

Strategy A

Increase Export Market for Local Specialty Agriculture Products

Project 1A. Expand Humboldt Made brand

a) Increase producer participation

b) Build on national trend toward "conscious consumerism"

c) Leverage relationships with cooperative marketing entities (Humboldt Ambassadors)

Project 2A. Support cooperative strategies that increase access to markets

a) Initiate collaborative sales events

b) Build shared sales force

c) Support buyer and media tours

d) Network producers with distributors and specialty food stores

e) Identify collaborative marketing projects to niche markets

f) Market Humboldt Made brand directly to consumers in niche markets

g) Expand to international customer base

Project 3A. Build Aquaculture Terminal Facility

a) Support development of an on-shore processing facility with refrigeration and quality control for small producers

b) Explore development of unused industrial land in Samoa
   · Deploy initial study to establish feasibility

c) Establish pre-permitting for bay and onshore sites

d) Increase on-shore production of shellfish and seed

e) Expand distribution of oysters in export markets

f) Farm additional species of shellfish, seaweed, and finfish

g) Expand to international customer base (China)

Strategy B

Increase Local Sales of Regional Specialty Agriculture Products

Project 1B. Investigate and potentially establish a cross-cluster, public market site

a) Connect local farmers, artists, craftspeople, value-added producers and restaurateurs
   · Initiate a study to establish feasibility

b) Build support across industry sectors: Specialty Agriculture, Arts, Tourism

c) Encourage development of space for Native Arts collective

d) Encourage tasting rooms for local food, beer and wine

Project 2B. Develop pathways to institutional sales

a) Review County purchasing mandates and encourage support of local choices

b) Support sales to schools, elder care facilities, hospitals, jail, etc.

Strategy C

Improve Infrastructure and Expand Facilities

Project 1C. Support development of a co-packing facility

a) Build a hub to distribute products and make bulk purchases

b) Create efficiencies with cooperative marketing

Project 2C. Provide seasonal access to commercial kitchen facilities

Project 3C. Increase access to dehydrating and flash freezing facilities

Project 4C. Develop a plan for refrigeration, distribution, aggregation and storage

Project 5C. Create mobile processing unit solutions

Strategy D

Provide Access To Expertise and Skilled Workforce

Project 1D. Provide access to expertise on topics that give local industry a competitive advantage

a) Seek assistance in research and problem solving

b) Increase access to soil and water conservation techniques

c) Support waste stream management solutions throughout sectors

d) Develop solutions for meat processing issues

Project 2D. Assist in developing business-to-business mentoring relationships

Project 3D. Provide support for small business permitting & permit streamlining

a) Provide land use planning tools and permitting assistance

b) Provide regulatory advocacy

Project 4D. Align schools' technical, career preparation activities with workforce and educational outreach efforts

a) Integrate a food sustainability curriculum

b) Support specialty agriculture career pathway

Strategy E

Support Agricultural Tourism

Project 1E. Assess agri-tourism resources between producers, CCVB and businesses with tasting rooms

Project 2E. Establish "U-Pick" agricultural experiences

Project 3E. Improve current state of wine industry tourism

a) Improve signage

b) Encourage tasting rooms

c) Support branding

Jobs in the Specialty Food, Flowers and Beverages Industry Cluster

The Specialty Food, Flowers and Beverages industry cluster is projected to add 1,816 jobs annually through 2018, which is the second highest among the Target industries. Low wage occupations will provide the most jobs (+59%) while 28% fall in the mid-wage and 13% in the higher wage categories. The higher wage jobs tend to require a Bachelor's Degree, though a few require only short term on-the-job training. Most mid-wage jobs in the industry require moderate to long term on-the-job training, while virtually all low wage jobs can be entered without experience and a short term on-the-job training degree (See chart: Occupational Employment Projections).

Figure 2-6: Specialty Food, Flowers and Beverages 2008-2018 Occupational Employment Projections

The following table indicates the distribution of high, mid & low wage jobs projected for Specialty Food, Flowers and Beverages from 2008 to 2018.

Wage Ranges	
Higher Wage	12%
Mid-Range Wage	30%
Lower Wage	58%

SOC Code	Occupation Title	Annual Average Employment		Employment Change (%)	Avg Annual Job Openings (by # of jobs)[1]	2010 Wages, Median Annual[2]	Education and Training Levels[3]
		2008	2018				
11-1021	General, Operations Managers	1,390	1,390	0.0	40	$76,125	4
11-9012	Farmers & Ranchers	4,170	4,240	2	33	$64,119	9
13-2011	Accountants & Auditors	530	610	15.1	17	$50,289	5
41-4012	Sales Reps, Wholesale, Manufacturing	500	540	8.0	17	$47,546	10
11-9011	Farm, Ranch, Other Ag Managers	610	630	3.3	14	$62,588	4
11-2022	Sales Managers	260	310	19.2	11	$70,804	4
11-1011	Chief Executives	280	270	-3.6	8	$105,327	4
11-9199	Managers, All Other	290	300	3.4	8	$96,785	8
11-3031	Financial Managers	330	360	9.1	8	$68,070	4
45-1011	Managers-Farming, Fishing, Forestry	230	250	8.7	8	$60,091	8
49-1011	Line Sups, Mgrs Mechs	260	270	3.8	8	$55,330	8
41-1012	Managers, Non-Retail Sales Workers	180	190	5.6	5	$53,686	8
51-1011	Sups, Mgrs Product. Operating Workers	280	280	0.0	4	$59,171	8
11-3011	Administrative Services Managers	190	190	0.0	4	$49,964	4
19-3021	Market Research	70	80	14.3	4	$47,520	3

The following table indicates the distribution of high, mid & low wage jobs projected for Specialty Food, Flowers and Beverages from 2008 to 2018.

Wage Ranges	
Higher Wage	12%
Mid-Range Wage	30%
Lower Wage	58%

SOC Code	Occupation Title	Annual Average Employment		Employment Change (%)	Avg Annual Job Openings (by # of jobs)[1]	2010 Wages, Median Annual[2]	Education and Training Levels[3]
		2008	2018				
49-3042	Heavy Equipment Mechanics	140	150	7.1	4	$46,774	7
11-3051	Industrial Production Managers	80	80	0.0	3	$89,332	5
41-4011	Sales , Manf, Tech, Scientific Prods	70	80	14.3	3	$70,423	10
15-1051	Computer Systems Analysts	90	100	11.1	3	$68,688	5
15-1071	Network, Computer System	130	140	7.7	3	$50,768	5
13-1079	HR, Labor Specialists	60	70	16.7	3	$49,496	5
13-1073	Training & Dev Spec	80	90	12.5	3	$49,416	5
13-1023	Buyer, not Wholesale, Retail	90	100	11.1	3	$47,739	5
49-9041	Industrial Machinery Mechanics	60	60	0.0	2	$50,101	9
53-1031	Line Supervisor, Mgrs Trans Operators	120	110	-8.3	2	$49,885	8
13-1072	Compens. Benefits, Job Specialists	50	60	20.0	2	$49,017	5
19-1013	Soil & Plant Scientists	50	50	0.0	2	$47,043	5
11-2021	Marketing Managers	30	40	33.3	1	$105,352	4
11-3071	Trans, Storage, Distribution Mgrs	50	40	-20.0	1	$76,623	8
11-3021	Computer, Info Systems Managers	60	60	0.0	1	$76,218	4
11-3061	Purchasing Managers	40	40	0.0	1	$58,581	4
49-9043	Maintenance Workers, Machinery	70	70	0.0	1	$46,612	9
				TOTAL # JOBS	227		
41-1011	Sups/Mgrs Retail Sales Workers	1,710	1,870	9.4	53	$36,962	8
43-4051	Customer Service Representatives	740	900	21.6	39	$29,619	10
43-9061	Office Clerks, General	2,150	2,240	4.2	38	$26,281	11
43-3031	Bookkeeping, Auditing Clerks	2,000	2,130	6.5	37	$33,420	10

The following table indicates the distribution of high, mid & low wage jobs projected for Specialty Food, Flowers and Beverages from 2008 to 2018.

Wage Ranges	
Higher Wage	12%
Mid-Range Wage	30%
Lower Wage	58%

SOC Code	Occupation Title	Annual Average Employment		Employment Change (%)	Avg Annual Job Openings (by # of jobs)[1]	2010 Wages, Median Annual[2]	Education and Training Levels[3]
		2008	2018				
37-3011	Landscaping Workers	1,680	1,840	9.5	36	$30,279	11
43-1011	Office-Admin Workers	1,160	1,240	6.9	34	$42,994	8
53-3032	Truck Drivers, Heavy & Tractor-Trailer	1,360	1,450	6.6	33	$38,070	10
49-9042	Maintenance, Repair Workers	1,190	1,290	8.4	28	$30,717	9
13-1199	Business Ops Specialists	770	820	6.5	22	$43,727	5
43-6011	Executive Secretaries., Admin Assistants	1,060	1,130	6.6	22	$36,768	10
53-3033	Truck Drivers, Light or Delivery Services	650	740	13.8	20	$31,859	11
53-7051	Industrial Truck & Tractor Operators	420	460	9.5	16	$38,252	11
29-2052	Pharmacy Technicians	260	330	26.9	14	$34,900	10
43-6014	Secretaries	990	960	-3.0	13	$29,218	10
43-5071	Shipping, Receiving, & Traffic Clerks	460	440	-4.3	11	$26,246	11
51-3021	Butchers & Meat Cutters	230	240	4.3	9	$32,197	9
11-9051	Food Service Managers	400	400	0.0	8	$43,379	8
49-3031	Bus, Truck Mechanics	250	270	8.0	8	$41,915	7
45-4021	Fallers	280	240	-14.3	8	$37,782	10
15-1041	Computer Support Specialists	250	260	4.0	8	$36,078	6
43-3021	Billing, Posting Clerks, Machine Operators	390	410	5.1	8	$29,969	10
45-4022	Logging Equipment Operators	250	240	-4.0	7	$36,616	10
43-3051	Payroll & Timekeeping Clerks	280	250	-10.7	7	$34,042	10
41-9099	Sales, Related Workers	110	140	27.3	6	$42,544	10
53-3031	Driver/Sales Workers	260	260	0.0	6	$27,520	11

The following table indicates the distribution of high, mid & low wage jobs projected for Specialty Food, Flowers and Beverages from 2008 to 2018.

Wage Ranges	
Higher Wage	12%
Mid-Range Wage	30%
Lower Wage	58%

SOC Code	Occupation Title	Annual Average Employment		Employment Change (%)	Avg Annual Job Openings (by # of jobs)[1]	2010 Wages, Median Annual[2]	Education and Training Levels[3]
		2008	2018				
51-3011	Bakers	200	200	0.0	6	$27,037	9
13-1022	Wholesale, Retail Buyers, No Farm	160	160	0.0	5	$36,384	5
27-1024	Graphic Designers	130	140	7.7	5	$36,042	5
43-4161	HR Assistants, Except Payroll	130	110	-15.4	4	$36,131	11
43-3011	Bill-Account Collectors	110	130	18.2	4	$36,030	11
51-9012	Still Machine Setters, Operators, & Tenders	150	180	20.0	4	$35,088	10
43-4151	Order Clerks	130	110	-15.4	4	$29,041	11
43-5061	Planning Clerks	80	90	12.5	3	$41,505	11
53-1021	Sups of Laborers	90	100	11.1	3	$38,400	8
43-3061	Procurement Clerks	80	90	12.5	3	$36,137	11
43-5111	Measurers, Checkers, Recordkeeping	70	80	14.3	3	$29,800	11
27-1026	Merch. Displayers & Window Trimmers	50	50	0.0	3	$28,839	10
27-1023	Floral Designers	50	60	20.0	3	$27,248	10
37-1011	Managers Housekpng Workers	230	220	-4.3	2	$35,728	8
49-9091	Vending Machine Servicers & Repairers	60	60	0.0	2	$34,122	10
51-9023	Machine Setters, Operators, & Tenders	50	50	0.0	2	$30,594	10
43-9199	Administrative Support Workers	90	70	-22.2	2	$29,358	10
15-1021	Computer Programmers	50	50	0.0	1	$39,384	5
49-3041	Farm Equipment Mechanics	40	40	0.0	1	$36,074	7
43-9011	Computer Operators	70	50	-28.6	1	$35,779	10
35-1011	Chefs & Head Cooks	100	100	0.0	1	$31,099	7
43-9021	Data Entry Keyers	70	50	-28.6	1	$25,741	10
				TOTAL # JOBS	554		

The following table indicates the distribution of high, mid & low wage jobs projected for Specialty Food, Flowers and Beverages from 2008 to 2018.

Wage Ranges	
Higher Wage	12%
Mid-Range Wage	30%
Lower Wage	58%

SOC Code	Occupation Title	Annual Average Employment		Employment Change (%)	Avg Annual Job Openings (by # of jobs)[1]	2010 Wages, Median Annual[2]	Education and Training Levels[3]
		2008	2018				
41-2011	Cashiers	3,770	4,130	9.5	205	$20,902	11
41-2031	Retail Salespersons	3,580	4,220	17.9	164	$20,840	11
35-3031	Waiters & Waitresses	2,050	2,080	1.5	117	$18,895	11
45-2092	Farm workers & Laborers	2,660	2,720	2.3	78	$19,477	11
35-3021	Combined Food Preparation	2,180	2,430	11.5	71	$19,090	11
35-3022	Counter Worker, Coffee Shop	620	660	6.5	50	$20,474	11
35-2021	Food Preparation Workers	1,130	1,150	1.8	42	$19,047	11
43-5081	Stock Clerks & Order Fillers	1,130	1,250	10.6	38	$21,935	11
53-7062	Laborers, Freight, Material Movers	1,010	1,060	5.0	37	$24,550	11
37-2012	Maids & Housekeeping	1,460	1,490	2.1	29	$19,877	11
35-9021	Dishwashers	620	650	4.8	28	$18,774	11
37-2011	Janitors, Cleaners, except Maids	1,350	1,300	-3.7	26	$24,921	11
41-2021	Counter & Rental Clerks	730	790	8.2	26	$19,671	11
43-4171	Receptionists & Information Clerks	700	740	5.7	23	$24,997	11
35-2011	Cooks, Fast Food	800	810	1.3	22	$18,911	11
35-3011	Bartenders	570	570	0.0	20	$19,297	11
35-2014	Cooks, Restaurant	670	690	3.0	19	$22,688	9
33-9032	Security Guards	630	650	3.2	15	$20,588	11
35-1012	Managers-Food Prep Workers	740	770	4.1	10	$24,526	8
53-7061	Cleaners of Vehicles & Equipment	190	210	10.5	9	$20,204	11
51-9111	Packaging & Filling Machine Operators	400	360	-10.0	7	$19,873	11
45-2091	Agricultural Equipment Operators	220	220	0.0	6	$19,227	10
53-7064	Packers & Packagers	380	370	-2.6	6	$19,067	11

The following table indicates the distribution of high, mid & low wage jobs projected for Specialty Food, Flowers and Beverages from 2008 to 2018.

Wage Ranges	
Higher Wage	12%
Mid-Range Wage	30%
Lower Wage	58%

SOC Code	Occupation Title	Annual Average Employment		Employment Change (%)	Avg Annual Job Openings (by # of jobs)[1]	2010 Wages, Median Annual[2]	Education and Training Levels[3]
		2008	2018				
51-3092	Food Batchmakers	60	70	16.7	3	$24,896	11
43-5032	Dispatchers, not Police, Fire, Ambulance	100	100	0.0	2	$24,571	10
51-9061	Inspectors, Testers, Samplers, Weighers	90	90	0.0	2	$23,866	10
51-9198	Helpers, Production Workers	130	130	0.0	2	$22,192	11
43-4071	File Clerks	60	50	-16.7	2	$19,654	11
35-3041	Food Servers, Non-restaurant	70	70	0.0	1	$22,219	11
				TOTAL # JOBS	1,060		

March 2009 Benchmark
Table includes the self-employed, unpaid family workers, private household workers, & farm employment. Occupations with employment below 30 in 2008 are excluded. Occupation subtotals may not add to the totals due to rounding & the suppression of data. N/A - Information is not available.

[1] Total Jobs are the sum of new jobs & replacement needs.

[2] Annual Wages are the estimated 50th percentile of the distribution of wages; 50% of workers in an occupation earn wages below, & 50% earn wages above the median wage. The wages are from 2010-1st quarter & do not include self-employed or unpaid family workers.

[3] Occupational training & education classifications were developed by the Bureau of Labor Statistics (BLS).

For more information on the classifications, please see the BLS Training Definitions.
1. First Professional Degree - LLD/MD
2. Doctoral Degree
3. Master's Degree
4. Bachelor's Degree or Higher & Some Work Experience
5. Bachelor's Degree
6. Associate Degree
7. Post-Secondary Vocational Education
8. Work Experience in a Related Occupation
9. Long term On-the-Job Training
10. Moderate Term On-the-Job Training
11. Short Term On-the-Job Training

INDUSTRY PROFILE: Building and Systems Construction

Figure 2-7: Building and Systems Construction Performance Summary

Building and Systems Construction	1995	2009	Percent Change, 1995 to 2009	Regional Comparison
Employment	6,111	7,134	16.7%	-6.1%
Firms	1485	1295	-12.8%	-15.5%
Wages	$36,503	$40,328	10.5%	6.7%
Concentration	.90	1.04	15.6%	N/A

The Building and Systems Construction industry cluster includes a number of industry groups that focus on the physical infrastructure of communities. The cluster serves the Redwood Coast regional needs for housing, commercial structures and community systems, such as roadways and utilities, as well as state and national customers. A variety of support services to the cluster have also grown, such as waste collection, treatment and disposal.

The cluster is the third largest of the Targets of Opportunity, employing 7,134 across the five-county region in 2009. Considering the recent economic downturn following the housing bust, the cluster's job growth rate (+16.7%) is significant compared to the region's loss (-6.1%) as a whole. The average wage is $38,393, which is 29% higher than the regional average of $29,794. Real wages also grew at a faster rate (+10.5%) than the regional average of 6.7%. In spite of the economic downturn, sector firms also decreased less than the regional average between 1995 and 2009.

Some individual industries have restructured by adding jobs in fewer firms (e.g., utility system construction, highway/street/bridge construction, building equipment contractors, building materials and supplies dealers). At the same time, other cluster sectors added firms (e.g., building finishing contractors, services to buildings and dwellings). The cluster's concentration increased from .90 in 1995 to 1.04 in 2009, which is just above the California average.

Examples: Redwood Coast businesses that fall under the category of Building and Systems Construction

A closer look at the industry groups comprising Building and Systems Construction (see Fig. 2-8) reveals that:

- The biggest employer, building material and supplies dealers, remained relatively unchanged in terms of job growth during the 1995-2009 period and increased wages at a slower rate (0.9%) in comparison to the region (6.7%) as a whole. The cluster's only other retailer, lawn and garden equipment and supplies, however, experienced significant growth. The industry increased jobs from 204 in 1995 to 436 in 2009 (114%) and saw an already high concentration of 1.65 increase to 6.47.
- Residential construction, the second largest component of this industry, experienced job contraction but substantial wage growth as average wages moved from below the regional average in 1995 to above it in 2009.
- While the residential construction sector did not add jobs, other sectors which often serve as residential construction sub-contractors grew substantially. Foundation, structure, and exterior finishing contractors, building equipment contractors, building finishing contractors and other specialty trade contractors all experienced firm, job and wage growth.

Figure 2-8: Building and Systems Construction Performance Detail

NAICS Code	Industry Sector (NAICS Title)	Regional Average Employment		Annual Average Growth Rate	Average Annual Wage ($ECI ADJ)	Average Annual Wage	Total Establishments			Regional Employment Concentration	
		1995	2009		1995	2009	1995	2009	% Change	1995	2009
2123 2131	Mining, Quarrying & Support Activities	54	96	3.7%	$28,956	$31,270	9	7	-22.2%	0.47	0.96
221 2371	Utilities & System Construction	606	672	0.6%	$76,295	$90,255	50	45	-10.0%	0.89	1.09
2361	Residential Building Construction	995	857	-0.9%	$26,714	$33,001	541	410	-24.2%	1.79	1.45
2362	Nonresidential Building Construction	270	255	-0.3%	$40,081	$39,939	50	25	-50.0%	0.64	0.65
2373	Highway, Street, and Bridge Construction	401	333	-1.1%	$55,543	$61,506	56	52	-7.1%	2.13	2.35
2379	Other Heavy and Civil Engineering Construction	20	22	0.6%	$29,928	$49,748	23	6	-73.9%	0.18	0.42
2381 2383	Foundation, Structure, & Building Exterior Finishing Contractors	514	856	3.2%	$25,778	$30,289	213	224	5.2%	0.40	0.66
2382 2389	Building Equipment & Other Specialty Trades Contractors	923	1038	0.7%	$39,451	$45,004	214	219	2.3%	0.74	0.73
4441	Building Material and Supplies Dealers	1320	1313	0.0%	$29,095	$29,349	127	90	-29.1%	2.15	1.93
4442	Lawn & Garden Equipment & Supplies Stores	204	436	4.6%	$23,383	$27,696	44	51	15.9%	1.65	6.47
5617	Building & Dwelling Service	627	869	1.9%	$25,838	$30,440	137	133	-2.9%	0.51	0.66
5621	Waste Collection	77	191	5.5%	$34,293	$30,948	13	21	61.5%	1.66	1.92
5622	Waste Treat. & Disposal	100	196	4.0%	$33,170	$42,782	8	12	50.0%	0.73	2.07

Industry Drivers and Opportunities in Building and Systems Construction

The market for home construction services is a significant driver in the Building and Systems Construction industry, which caused this industry to suffer the greatest impact from the recent economic recession. In the Redwood Coast region, the industry underwent a significant restructuring toward the end of the period, which resulted in less job and firm loss than occurred in the state and nation. This is also an indicator of the local industry's ability to adapt and diversify.

A substantial part of this diversity comes from firms manufacturing parts and materials for large public or commercial construction, such as bridges, utilities, multi-story buildings and pollution-control equipment for large manufacturers. Waste collection, treatment and disposal represent another growing and high paying sector within the industry. Federal and state agencies are frequent buyers of these parts and services, making them a significant driver of the industry.

Another substantial and growing sector of the industry includes sellers of soil amendments. The dramatic increase in the number of jobs and the fact that the number of jobs is six times higher than the state average indicates that gardening, and likely marijuana cultivation, are driving this sector of the industry.

Skill levels affect employability and often determine funding flows for jobs in this industry. Many skilled carpenters doing home remodels continued working and experienced wage increases as a result of the recession as homeowners improved existing homes rather than purchasing new ones. Less skilled workers were laid off.

Public construction requires a journey level workforce. Providing training and skill-upgrade opportunities for local residents will make regional companies more competitive and result in more local workers securing employment in and out of the area.

Strategic Work Plan for Building and Systems Construction

Two groups of leaders in the Building and Systems Construction industry cluster were convened to discuss challenges and opportunities in their industries. A "Green" Building Council was formed to address the significant interest and funding from the state in "green" private sector construction. This discussion was lead by Steve Salzman of Greenway Partners and Jacquelyn Dyer of Humboldt County Economic Development and resulted in a detailed report and strategic work plan for stimulating the "green" aspects of the Building industry.

A second group of Building industry leaders was convened by Jacqueline Debets of the Humboldt County Economic Development Division and Steve Salzman to discuss overall industry opportunities. This group shared some overlap with the Green Building Council and the following strategic work plan combines and summarizes input from both discussions.

Key Issues

A) Major market adjustment for industry

B) Qualified labor

Assets

A) Quality of life attracts talented people to live here

Quick Wins

A) Local preference policy

STRATEGY A

Increase Use Of Locally-Owned Companies And Expertise For Large Projects

Project 1A. Develop a local hire preference policy for large institutions, non-profit and private companies, demonstrating return-to-local economy

Project 2A. Make it easier for construction "waste" to be collected, re-used and recycled

Project 3A. Provide technical assistance and training for successful bidding on state and federal projects

STRATEGY B

Increase Capacity Of Workforce

Project 1B. Focus training on dislocated and incumbent workers to upgrade skills (new trainees in one area don't bring the breadth of knowledge necessary)

Project 2B. Train for HVAC and appliance repair focused on energy efficiency

Project 3B. Develop and expand training in high school and community college for basic plumbing, electrical, carpentry, safety and green construction technology

Project 4B. Develop and offer certified training locally to eliminate need to travel for certifications

STRATEGY C

Stimulate Market For Green Building

Project 1C. Identify all incentive programs and make them easy to understand and access

Project 2C. Develop and utilize alternative financing mechanisms and other programs to stimulate the green building market, such as PACE and Energy Upgrade California

Project 3C. Utilize grant funds to lower building costs and incentivize green building

Project4C. Build and upgrade public buildings with energy-efficient design for low-cost, high efficiency maintenance

Project 5C. Include recycled content and sustainably-produced building materials in procurement

Project 6C. Encourage clients to have an energy audit and complete upgrades as part of mortgage loan

Project 7C. Develop favorable financing packages for building performance improvement projects, commercial and personal

STRATEGY D

Upgrade Infrastructure to Reduce Costs and Support Quality of Life

Project 1D. Support redundant fiber optic connectivity for the Internet

Project 2D. Expand airport service

Project 3D. Facilitate effort to secure STAA truck access on highways

Project 4D. Preserve and expand access to natural amenities through trails and other public access points

Jobs in the Building and Systems Construction Industry Cluster

By 2018, over fifteen hundred (1,553) job opportunities are projected to open annually in the Building and Systems Construction industry cluster. Nineteen percent of these jobs will be in higher wage occupations, 39% in the mid-wage and 42% in the lower wage occupations. Top growing occupations in the industry cluster are distributed across all wage levels. The higher wage occupations frequently require a Bachelor's Degree and/or long term on-the-job training. Mid-wage occupations are accessible with moderate to long term on-the-job training (see table: Occupational Employment Projections).

Figure 2-9: Building and Systems Construction 2008-2018 Occupational Employment Projections

The following table indicates the distribution of high, mid & low wage jobs projected for Building and Systems Construction from 2008 to 2018.

Wage Ranges	
Higher Wage	19%
Mid-Range Wage	39%
Lower Wage	42%

SOC Code	Occupation Title	Annual Average Employment		Employment Change (%)	Avg Annual Job Openings (by # of jobs)[1]	2010 Wages, Median Annual[2]	Education and Training Levels[3]
		2008	2018				
11-2021	Marketing Managers	30	40	33.3	1	$105,352	4
11-1011	Chief Executives	280	270	-3.6	8	$105,327	4
11-9199	Managers, All Other	290	300	3.4	8	$96,785	8
17-2051	Civil Engineers	250	260	4.0	5	$91,616	5
11-9021	Construction Managers	160	180	12.5	3	$89,509	5
11-3051	Industrial Prod Mgrs.	80	80	0.0	3	$89,332	5
17-2071	Electrical Engineers	30	40	33.3	2	$87,381	5
17-2081	Environmental Engineers	40	50	25.0	2	$80,579	5
51-8013	Power Plant Operators	130	150	15.4	6	$76,907	9
11-3071	Trans, Strge Dist. Mgrs	50	40	-20.0	1	$76,623	8
11-3021	Computer, Info Syst Mgrs	60	60	0.0	1	$76,218	4
15-1031	Comp Sftware Engrs, Appl's	60	80	33.3	3	$75,180	5
13-2051	Financial Analysts	50	60	20.0	2	$71,334	5
11-2022	Sales Managers	260	310	19.2	11	$70,804	4
47-1011	Sups, Mgrs Const Trades	370	410	10.8	11	$69,425	8
15-1051	Comp Syst Analysts	90	100	11.1	3	$68,688	5
11-3031	Financial Managers	330	360	9.1	8	$68,070	4
13-1031	Claims Adj Investigators	60	60	0.0	2	$63,007	9
13-2072	Loan Officers	70	80	14.3	2	$62,575	5
51-1011	Sups, Opert'g Workers	280	280	0.0	4	$59,171	8
11-3061	Purchasing Managers	40	40	0.0	1	$58,581	4

The following table indicates the distribution of high, mid & low wage jobs projected for Building and Systems Construction from 2008 to 2018.

Wage Ranges	
Higher Wage	19%
Mid-Range Wage	39%
Lower Wage	42%

SOC Code	Occupation Title	Annual Average Employment		Employment Change (%)	Avg Annual Job Openings (by # of jobs)[1]	2010 Wages, Median Annual[2]	Education and Training Levels[3]
		2008	2018				
49-2022	IT Equip Installers	200	220	10.0	6	$58,571	9
49-9052	Telecom Inst. & Repairers	130	140	7.7	4	$57,984	9
47-2111	Electricians	180	190	5.6	5	$55,912	9
13-1051	Cost Estimators	110	140	27.3	5	$55,722	5
49-1011	Line Sups, Mgrs Mechs	260	270	3.8	8	$55,330	8
15-1081	Network Syst, Data Analysts	110	160	45.5	7	$54,172	5
41-1012	Mgers, Non-Retail Sales	180	190	5.6	5	$53,686	8
19-2041	Mgers, Non-Retail Sales	180	210	16.7	8	$53,232	5
43-5041	Meter Readers	60	50	-16.7	2	$52,695	11
17-3031	Surveying, Map'n Techs	80	90	12.5	2	$52,432	10
13-1111	Management Analysts	540	620	14.8	17	$52,391	4
15-1071	Network, Comp System	130	140	7.7	3	$50,768	5
17-3011	Arch, Civil Drafters	80	80	0.0	2	$50,695	7
13-2011	Accountants & Auditors	530	610	15.1	17	$50,289	5
17-3022	Civil Eng Technicians	70	70	0.0	1	$50,145	6
49-9041	Industrial Mechanics	60	60	0.0	2	$50,101	9
11-3011	Admin Svs Managers	190	190	0.0	4	$49,964	4
53-1031	Trans Mgrs, Veh Operator	120	110	-8.3	2	$49,885	8
13-1079	HR, Labor Specialists	60	70	16.7	3	$49,496	5
13-1073	Training & Dev Spec	80	90	12.5	3	$49,416	5
13-1072	Comp Bene's, Job Specialists	50	60	20.0	2	$49,017	5
47-4011	Const, Bldg Inspectors	70	70	0.0	1	$48,877	8
47-2152	Plumbers, Steamfitters	310	340	9.7	9	$48,582	9
13-1023	Buyers, not Wholesale	90	100	11.1	3	$47,739	5
19-4091	Envir Science, Technicians	90	100	11.1	6	$47,588	6
41-4012	Sales Reps, Wholesale	500	540	8.0	17	$47,546	10
19-3021	Market Research	70	80	14.3	4	$47,520	3
47-2081	Drywall Tile Installers	100	110	10.0	2	$47,131	10
47-2051	Masons & Concrete	140	140	0.0	4	$46,813	9

The following table indicates the distribution of high, mid & low wage jobs projected for Building and Systems Construction from 2008 to 2018.

Wage Ranges	
Higher Wage	19%
Mid-Range Wage	39%
Lower Wage	42%

SOC Code	Occupation Title	Annual Average Employment		Employment Change (%)	Avg Annual Job Openings (by # of jobs)[1]	2010 Wages, Median Annual[2]	Education and Training Levels[3]
		2008	2018				
51-8031	Waste Treatment	280	310	10.7	9	$46,792	9
49-3042	Heavy Equip Mechanics	140	150	7.1	4	$46,774	7
47-2073	Operating Engineers	400	420	5.0	9	$46,760	10
47-2031	Carpenters	1,120	1,170	4.5	20	$46,496	9
41-3099	Sales Reps, Services	130	140	7.7	5	$45,626	10
47-2181	Roofers	190	180	-5.3	3	$45,485	10
				TOTAL # JOBS	291		
17-1011	Architects	40	40	0.0	1	$44,520	5
13-1199	Business Ops Specialists	770	820	6.5	22	$43,727	5
43-1011	Office-Admin Workers	1,160	1,240	6.9	34	$42,994	8
41-9099	Sales, Related Workers	110	140	27.3	6	$42,544	10
49-3031	Bus, Truck Mechanics	250	270	8.0	8	$41,915	7
47-2071	Surfacing Operators	50	50	0.0	1	$41,644	10
43-5061	Planning Clerks	80	90	12.5	3	$41,505	11
37-1012	Managers, Landscaping	310	340	9.7	6	$41,315	8
37-3013	Trimmers & Pruners	180	220	22.2	6	$41,093	11
47-2141	Painters, Maintenance	430	430	0.0	7	$40,477	10
51-4041	Machinists	60	60	0.0	1	$40,444	9
47-2211	Sheet Metal Workers	70	70	0.0	2	$39,933	10
51-4121	Welders, Solderers	140	160	14.3	5	$39,625	7
49-9021	Heating, Air, Mechanics	50	50	0.0	2	$39,032	9
49-3023	Auto Service Techs	560	630	12.5	18	$38,659	7
47-4041	Haz Materials Workers	30	40	33.3	2	$38,508	10
53-1021	Sups of Laborers	90	100	11.1	3	$38,400	8
53-7051	Ind Truck & Tractor Ops	420	460	9.5	16	$38,252	11
49-2098	Security Syst Installers	40	40	0.0	2	$38,117	7
53-3032	Truck, Tractor Drivers	1,360	1,450	6.6	33	$38,070	10
49-2097	Home Ent Sys Installers	30	40	33.3	1	$37,985	7
41-1011	Sups Retail Sales Workers	1,710	1,870	9.4	53	$36,962	8

The following table indicates the distribution of high, mid & low wage jobs projected for Building and Systems Construction from 2008 to 2018.

Wage Ranges	
Higher Wage	19%
Mid-Range Wage	39%
Lower Wage	42%

SOC Code	Occupation Title	Annual Average Employment		Employment Change (%)	Avg Annual Job Openings (by # of jobs)[1]	2010 Wages, Median Annual[2]	Education and Training Levels[3]
		2008	2018				
43-6011	Exec Secs, Admin Assts	1,060	1,130	6.6	22	$36,768	10
13-1022	Wholesale, Retail Buyers,	160	160	0.0	5	$36,384	5
43-3061	Procurement Clerks	80	90	12.5	3	$36,137	11
43-4161	HR Assistants, Except Payroll	130	110	-15.4	4	$36,131	11
15-1041	Comp Support Specialists	250	260	4.0	8	$36,078	6
43-3011	Bill-Account Collectors	110	130	18.2	4	$36,030	11
53-7032	Excavating & Dragline Ops	30	40	33.3	2	$35,923	10
37-1011	Mgrs Hskpg Workers	230	220	-4.3	2	$35,728	8
43-3051	Payroll Clerks	280	250	-10.7	7	$34,042	10
47-2061	Construction Laborers	1,070	1,190	11.2	19	$33,493	10
43-3031	Bookkeeping, Auditing Clerks	2,000	2,130	6.5	37	$33,420	10
11-9141	Property, Real Estate Mgrs.	420	440	4.8	9	$33,236	5
43-4131	Loan Interviewers	80	90	12.5	3	$32,892	11
53-7081	Recyclable Mat Collectors	170	240	41.2	12	$32,456	11
53-3033	Truck Drivers, Del. Services	650	740	13.8	20	$31,859	11
51-7041	Sawing Mach Setters	320	350	9.4	9	$31,268	10
49-9099	Installation Workers	150	160	6.7	3	$30,900	10
49-9042	Maintenance, Workers	1,190	1,290	8.4	28	$30,717	9
37-3011	Landscaping, Groundskprs	1,680	1,840	9.5	36	$30,279	11
47-3015	Pipelayers, Steamfitters	90	100	11.1	4	$30,086	11
43-3021	Billing, Posting Clerks,	390	410	5.1	8	$29,969	10
43-5111	Measurers, Recordkeeping	70	80	14.3	3	$29,800	11
43-4051	Customer Service Reps	740	900	21.6	39	$29,619	10
43-9199	Admin Support Workers	90	70	-22.2	2	$29,358	10
43-6014	Secretaries	990	960	-3.0	13	$29,218	10
43-4151	Order Clerks	130	110	-15.4	4	$29,041	11
51-7011	Cabinetmaker, Carpenters	70	70	0.0	2	$28,867	9
27-1026	Merchandise Displayers	50	50	0.0	3	$28,839	10
51-7042	Woodworking, Operators	210	240	14.3	7	$28,595	10

The following table indicates the distribution of high, mid & low wage jobs projected for Building and Systems Construction from 2008 to 2018.

Wage Ranges	
Higher Wage	19%
Mid-Range Wage	39%
Lower Wage	42%

SOC Code	Occupation Title	Annual Average Employment		Employment Change (%)	Avg Annual Job Openings (by # of jobs)[1]	2010 Wages, Median Annual[2]	Education and Training Levels[3]
		2008	2018				
51-2099	Assemblers & Fabricators	110	110	0.0	3	$27,918	10
53-3031	Driver/Sales Workers	260	260	0.0	6	$27,520	11
27-1023	Floral Designers	50	60	20.0	3	$27,248	10
43-9061	Office Clerks, General	2,150	2,240	4.2	38	$26,281	11
43-5071	Shipping, Recving Clerks	460	440	-4.3	11	$26,246	11
47-3012	Helpers, Carpenters	50	50	0.0	2	$25,192	11
				TOTAL # JOBS	613		
43-4171	Receptionists Info Clerks	700	740	5.7	23	$24,997	11
37-2011	Janitors, Cleaners	1,350	1,300	-3.7	26	$24,921	11
43-5032	Dispatchers	100	100	0.0	2	$24,571	10
53-7062	Laborers, Movers	1,010	1,060	5.0	37	$24,550	11
41-9022	Real Estate Sales Agents	80	90	12.5	2	$23,689	7
51-9198	Helpers, Prod. Workers	130	130	0.0	2	$22,192	11
43-5081	Stock Clerks & Order Fillers	1,130	1,250	10.6	38	$21,935	11
41-2011	Cashiers	3,770	4,130	9.5	205	$20,902	11
41-2031	Retail Salespersons	3,580	4,220	17.9	164	$20,840	11
33-9032	Security Guards	630	650	3.2	15	$20,588	11
37-2012	Maids & Housekeeping	1,460	1,490	2.1	29	$19,877	11
41-2021	Counter & Rental Clerks	730	790	8.2	26	$19,671	11
43-4071	File Clerks	60	50	-16.7	2	$19,654	11
45-2092	Farmworkers & Laborers	2,660	2,720	2.3	78	$19,477	11
				TOTAL # JOBS	649		

March 2009 Benchmark

Table includes the self-employed, unpaid family workers, private household workers, & farm employment. Occupations with employment below 30 in 2008 are excluded. Occupation subtotals may not add to the totals due to rounding & the suppression of data. N/A - Information is not available.

[1] Total Jobs are the sum of new jobs & replacement needs.

[2] Annual Wages are the estimated 50th percentile of the distribution of wages; 50% of workers in an occupation earn wages below, & 50% earn wages above the median wage. The wages are from 2010-1st quarter & do not include self-employed or unpaid family workers.

[3] Occupational training & education classifications were developed by the Bureau of Labor Statistics (BLS).

For more information on the classifications, please see the BLS Training Definitions.

1. First Professional Degree - LLD/MD
2. Doctoral Degree
3. Master's Degree
4. Bachelor's Degree or Higher & Some Work Experience
5. Bachelor's Degree
6. Associate Degree
7. Post-Secondary Vocational Education
8. Work Experience in a Related Occupation
9. Long term On-the-Job Training
10. Moderate Term On-the-Job Training
11. Short Term On-the-Job Training

INDUSTRY PROFILE: Investment Support Services

Figure 2-10: Investment Support Services Performance Summary

Investment Support Services	1995	2009	Percent Change, 1995 to 2009	Regional Comparison
Employment	2314	2578	11.4%	-6.1%
Firms	550	599	8.9%	-15.5%
Wages	$32,539	$38,886	19.5%	6.7%
Concentration	0.58	0.69	19.0	N/A

Investment Support Services industry cluster is a growing range of professional advisory services that help people and businesses evaluate and execute investment decisions, including:

- Making mortgage and real estate loans
- Investing in high-grade securities
- Engaging in sales financing or sales financing in combination with leasing
- Extending credit through credit instruments (except credit cards and sales finance agreements)
- Acting as agents (i.e., brokers) between buyers and sellers in buying or selling securities, real estate, or insurance products on a commission or transaction fee basis
- Estimating the fair market value of real estate

Investment Support Services is the fourth largest of the Targets of Opportunity, employing 2,578 across the five county region. It has added jobs at a faster rate (+8.9%) than the regional economy as a whole (-6.1%) over the 1995-2009 period. It pays an average wage ($38,886) that is over 30% higher than the regional average of $29,794. Real wages also grew at a much faster rate (+19.5%) than the regional average of 6.7%. Moreover, Investment Support Services Firms increased by 8.9% between 1995 and 2009, which is far beyond the region's growth rate (-15.5%). Between 1995 and 2009, the cluster also grew more competitive, increasing concentration when compared to California as a whole.

Examples: Redwood Coast businesses that fall under the category of Investment Support Services

ReProp Financial

PremierFinancial Group
OUR GOAL IS YOUR FINANCIAL PEACE OF MIND

Redwood Credit Union

MikkiMoves Real Estate

Redwood Capital Bank

Cholwell Benz & Hartwick
ACCOUNTANTS AND CONSULTANTS

A closer look at the industry groups comprising Investment Support Services (See Fig. 2-11) reveals that:

- The biggest employer is depository credit intermediation (i.e., commercial banks, savings institutions and credit unions). This sector contracted following the 2006 economic downturn and was the most affected sector within this target industry, shedding 174 jobs (13.3%) over the 14-year period—which is about twice the overall region job loss rate of 6.1%. However, it shifted from an employment concentration below to one slightly above the state average—indicating that this sector fared better in the Redwood Coast region than in the state as a whole. The sector's wage growth (2.1%) lagged behind the regional average of 6.7%.
- Real estate service providers are the second largest employer and reflected an 11.6% average growth rate in spite of the 2006 housing bust. Additionally, the sector experienced a real wage increase of 46%, moving from substantially below the regional average to a level marginally below.
- With the single exception of depository credit intermediation, all other investment support services industries increased jobs over the 1995-2009 period.
- Overall, three-fourths of cluster's industry groups experienced firm growth, increasing from 550 in 1995 to nearly 600 in 2009.

Figure 2-11: Investment Support Services Performance Detail

NAICS Code	Industry Sector (NAICS Title)	Regional Average Employment		Annual Average Growth Rate	Average Annual Wage ($ECI ADJ)	Average Annual Wage	Total Establishments			Regional Employment Concentration	
		1995	2009		1995	2009	1995	2009	% Change	1995	2009
5221	Depository Credit Intermediation	1305	1131	-0.8%	$33,392	$34,087	90	112	24.4%	0.84	1.04
5222 5223	Nondepository Credit Intermediation & Related Activities	101	303	7.1%	$35,822	$55,786	33	47	42.4%	0.20	0.54
5231 5232	Securities & Commodity Contracts Intermediation & Exchanges	72	114	2.9%	$75,116	$75,884	17	34	100.0%	0.25	0.45
5239 5251	Other Financial Investment Activities & Benefit Funds	13	131	15.5%	$55,198	$40,058	12	25	108.3%	0.06	0.40
5242	Agencies, Brokerages, and Other Insurance Related Activities	347	368	0.3%	$37,400	$44,200	106	102	-3.8%	0.53	0.59
5312 5313	Offices of Real Estate Agents and Brokers & Related Activities	476	531	0.7%	$18,902	$27,548	162	167	3.1%	0.62	0.61
5412	Accounting, Tax Preparation, Bookkeeping, and Payroll Services	257	383	2.4%	$27,925	$29,772	130	112	-13.8%	0.30	0.51

Industry Drivers and Opportunities for Investment Support Services

Investment decisions are highly personal, making relationships a driving factor in the Investment Support Services industry. Individual talent and company culture tend to be determining factors when clients engage professionals, so attracting and retaining skilled workers is critical to strengthening this industry. The quality of life on the Redwood Coast provides a unique incentive for talented people with strong client networks to locate here, continue their career and import capital into the region.

Experts in this cluster also have the interest and skills needed to address significant business and economic development challenges such as succession planning, which eventually allows founders to ensure the continued operation of their business while retiring or start a new venture. This industry can provide services that assist owners through the process of selling/transferring their business to new ownership/management.

Strategic Work Plan for Investment Support Services

Approximately twelve business owners and executives from Investment Support Services met twice to discuss the industry trends, challenges and opportunities. Dawn Elsbree, Headwaters Fund Executive Director, and Jacqueline Debets from the Humboldt County Economic Development Division, convened and facilitated these cluster meetings and drafted the following work plan based on the priorities that emerged from industry leaders discussions.

Key Issues

A) Limited talent and retiring workforce

B) Lack of business succession planning

Assets

A) Quality of life attracts talented people to live here (e.g. lack of commute, air quality, access to natural amenities, etc.)

Quick Wins

A) Define name, number and range of businesses needing succession assistance, and promote them.

STRATEGY A

Develop & Retain Advanced-Skill Workforce

Project 1A. Provide education and training for targeted advanced-skill workers to prepare for retirement and maintain local workforce and prevent out-sourcing (e.g. commercial underwriting, appraisals, actuarial, 401k third-party services, CPA)

Project 2A. Mentor younger workers to advance in the industry

Project 3A. Provide high school training for entry-level workforce

Project 4A. Provide jobs for spouses of hires moving here

Project 5A. Encourage natives to boomerang (come back home after leaving for a time to secure education/ specialized training)

Project 6A. Ensure access to quality health care

Project 7A. Learn and apply best practices in employee retention

STRATEGY B

Increase Regional Collaboration to Support Entrepreneurial Businesses

Project 1B. Support alternative funding sources for start-up companies

Project 2B. Encourage professional services for business (e.g. lawyers, CPAs, landlords, bankers) to work together to set up business structure at low or no cost to start-up business

Project 3B. Help small businesses understand and comply with regulation

Project 4B. Help small businesses understand different needs for capital: (1) start-up; (2) expansion/ turnaround; (3) owner cash out

Project 5B. Facilitate Succession Planning for companies

a) Understand number and range of business with owners likely to retire in the next 5-10 years
b) Increase estate planning as one way to maintain local ownership of businesses and land assets
c) Seek methods for private equity and capital sources to transition mature businesses from founding entrepreneur to new ownership/management
d) Develop expertise in business sale, acquisition and turnaround to assist companies
e) Educate business owners early on about the options available for maintaining local ownership of their business.

STRATEGY C

Upgrade Infrastructure to Reduce Costs and Support Quality of Life

Project 1C. Build out broadband connectivity into the rural areas

Project 2C. Expand airport service

Project 3C. Facilitate STAA truck access on highways

Project 4C. Preserve and expand access to natural amenities through trails and other public access points

Jobs in the Investment Support Services Industry Cluster

Over one thousand (1,019) job opportunities are projected to open annually in the Investment Support Services industry cluster through 2018. 24% of these jobs will be in higher wage occupations, 45% in the mid-wage and 31% in the lower wage occupations. The higher wage occupations generally require a Bachelor's Degree, while mid-wage can be entered with significant on-the-job training and certificates (see table: Occupational Employment Projections).

Figure 2-12: Investment Support Services 2008-2018 Occupational Employment Projections

The following table indicates the distribution of high, mid & low wage jobs projected for Investment Support Services from 2008 to 2018.

Wage Ranges	
Higher Wage	24%
Mid-Range Wage	45%
Lower Wage	31%

SOC Code	Occupation Title	Annual Average Employment		Employment Change (%)	Avg Annual Job Openings (by # of jobs)[1]	2010 Wages, Median Annual[2]	Education and Training Levels[3]
		2008	2018				
11-2021	Marketing Managers	30	40	33.3	1	$105,352	4
11-1011	Chief Executives	280	270	-3.6	8	$105,327	4
11-9199	Managers, All Other	290	300	3.4	8	$96,785	8
11-9021	Construction Managers	160	180	12.5	3	$89,509	5
11-9111	Medical & Health Services Managers	300	320	6.7	8	$81,713	4
11-3021	Computer, Info Systems Mgrs	60	60	0.0	1	$76,218	4
11-1021	General, Operations Mgrs	1,390	1,390	0.0	40	$76,125	4
15-1031	Computer Software Engrs, Appl's	60	80	33.3	3	$75,180	5
13-2051	Financial Analysts	50	60	20.0	2	$71,334	5
11-2022	Sales Managers	260	310	19.2	11	$70,804	4
11-3041	Compensation, Benefits Mgers	30	30	0.0	1	$70,096	4
47-1011	Sups, Mgrs Construction Trades	370	410	10.8	11	$69,425	8
15-1051	Comp Systems Analysts	90	100	11.1	3	$68,688	5
11-3031	Financial Managers	330	360	9.1	8	$68,070	4
13-1031	Claims Adj Investigators	60	60	0.0	2	$63,007	9
13-2072	Loan Officers	70	80	14.3	2	$62,575	5
11-2031	Public Relations Managers	30	30	0.0	1	$57,955	4
15-1061	Database Administrators	40	40	0.0	1	$57,707	5
47-2111	Electricians	180	190	5.6	5	$55,912	9
41-3031	Financial Services Sales Agents	60	60	0.0	2	$55,756	5

The following table indicates the distribution of high, mid & low wage jobs projected for Investment Support Services from 2008 to 2018.

Wage Ranges	
Higher Wage	24%
Mid-Range Wage	45%
Lower Wage	31%

SOC Code	Occupation Title	Annual Average Employment		Employment Change (%)	Avg Annual Job Openings (by # of jobs)[1]	2010 Wages, Median Annual[2]	Education and Training Levels[3]
		2008	2018				
49-1011	Line Sups, Mgrs Mechs	260	270	3.8	8	$55,330	8
15-1081	Network Syst, Data Analysts	110	160	45.5	7	$54,172	5
41-1012	Line Sups/Mgrs, Non-Retail Sales	180	190	5.6	5	$53,686	8
13-1111	Management Analysts	540	620	14.8	17	$52,391	4
15-1071	Network, Comp System	130	140	7.7	3	$50,768	5
13-2011	Accountants & Auditors	530	610	15.1	17	$50,289	5
11-3011	Admin Svs Managers	190	190	0.0	4	$49,964	4
13-2052	Personal Financial Advisors	70	90	28.6	3	$49,859	5
13-1079	HR, Labor Specialists	60	70	16.7	3	$49,496	5
13-1073	Training & Dev Spec	80	90	12.5	3	$49,416	5
13-1072	Comp Bene's, Job Specialists	50	60	20.0	2	$49,017	5
47-2152	Plumbers, Steamfitters	310	340	9.7	9	$48,582	9
21-1022	Med. Public Health Social Workers	100	110	10.0	3	$48,389	5
13-1023	Buyers, not Wholesale	90	100	11.1	3	$47,739	5
19-3021	Market Research	70	80	14.3	4	$47,520	3
13-1071	Employment Specialists	50	60	20.0	2	$47,059	5
47-2031	Carpenters	1,120	1,170	4.5	20	$46,496	9
41-3099	Sales Reps, Services	130	140	7.7	5	$45,626	10
13-1041	Compl. Officers, not Agric, Const, Health	150	180	20.0	5	$45,528	9
13-2021	Real Estate Appraisers & Assessors	40	40	0.0	1	$45,223	7
				TOTAL # JOBS	245		
23-2011	Paralegals & Legal Assistants	100	110	10.0	2	$44,299	6
13-1199	Business Operations Specialists	770	820	6.5	22	$43,727	5
43-1011	Office-Admin Workers	1,160	1,240	6.9	34	$42,994	8

The following table indicates the distribution of high, mid & low wage jobs projected for Investment Support Services from 2008 to 2018.

Wage Ranges	
Higher Wage	24%
Mid-Range Wage	45%
Lower Wage	31%

SOC Code	Occupation Title	Annual Average Employment		Employment Change (%)	Avg Annual Job Openings (by # of jobs)[1]	2010 Wages, Median Annual[2]	Education and Training Levels[3]
		2008	2018				
41-9099	Sales, Related Workers	110	140	27.3	6	$42,544	10
43-5061	Production, Planning Expediting Clerks	80	90	12.5	3	$41,505	11
37-1012	Mgrs, Lawn Service, Groundskeeping	310	340	9.7	6	$41,315	8
47-2141	Painters, Maintenance	430	430	0.0	7	$40,477	10
15-1021	Computer Programmers	50	50	0.0	1	$39,384	5
49-9021	Heating, Air Mechanics	50	50	0.0	2	$39,032	9
53-7051	Industrial Truck & Tractor Operators	420	460	9.5	16	$38,252	11
43-6012	Legal Secretaries	190	190	0.0	3	$37,567	7
41-1011	Sups/Mgrs Retail Sales Workers	1,710	1,870	9.4	53	$36,962	8
43-6011	Exec Secretaries, Admin Assistants	1,060	1,130	6.6	22	$36,768	10
43-4161	HR Assistants, Except Payroll	130	110	-15.4	4	$36,131	11
15-1041	Computer Support Specialists	250	260	4.0	8	$36,078	6
27-1024	Graphic Designers	130	140	7.7	5	$36,042	5
43-3011	Bill-Account Collectors	110	130	18.2	4	$36,030	11
43-9041	Insurance Claims-Policy Clerks	120	120	0.0	2	$36,003	10
53-7032	Excavating, Loading, Dragline Operators	30	40	33.3	2	$35,923	10
43-9011	Computer Operators	70	50	-28.6	1	$35,779	10
37-1011	Managers Housekpng, Janitorial Workers	230	220	-4.3	2	$35,728	8
43-3051	Payroll & Timekeeping Clerks	280	250	-10.7	7	$34,042	10
39-1021	Managers of Personal Service Workers	180	190	5.6	6	$33,997	8
43-3031	Bookkeeping, Acct., Auditing Clerks	2,000	2,130	6.5	37	$33,420	10

The following table indicates the distribution of high, mid & low wage jobs projected for Investment Support Services from 2008 to 2018.

Wage Ranges	
Higher Wage	24%
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Lower Wage	31%

SOC Code	Occupation Title	Annual Average Employment		Employment Change (%)	Avg Annual Job Openings (by # of jobs)[1]	2010 Wages, Median Annual[2]	Education and Training Levels[3]
		2008	2018				
11-9141	Property, Community Association Managers	420	440	4.8	9	$33,236	5
43-4131	Loan Interviewers & Clerks	80	90	12.5	3	$32,892	11
53-7081	Refuse & Recyclable Material Collectors	170	240	41.2	12	$32,456	11
43-9022	Word Processors & Typists	70	60	-14.3	1	$31,779	10
49-9042	Maintenance, Repair Workers	1,190	1,290	8.4	28	$30,717	9
37-3011	Landscaping Workers	1,680	1,840	9.5	36	$30,279	11
41-9021	Real Estate Brokers	30	30	0.0	1	$30,134	8
43-3021	Billing, Posting Clerks, Machine Operators	390	410	5.1	8	$29,969	10
43-4051	Customer Service Representatives	740	900	21.6	39	$29,619	10
43-9199	Administrative Support Workers	90	70	-22.2	2	$29,358	10
43-6014	Secretaries	990	960	-3.0	13	$29,218	10
43-9061	Office Clerks, General	2,150	2,240	4.2	38	$26,281	11
27-3031	Public Relations Specialists	100	120	20.0	4	$26,187	5
43-4141	New Accounts Clerks	110	120	9.1	4	$25,839	8
43-9021	Data Entry Keyers	70	50	-28.6	1	$25,741	10
				TOTAL # JOBS	454		
43-4171	Receptionists & Information Clerks	700	740	5.7	23	$24,997	11
37-2011	Janitors, Cleaners, except Maids	1,350	1,300	-3.7	26	$24,921	11
53-7062	Laborers, Freight, Stock, Movers	1,010	1,060	5.0	37	$24,550	11
41-9022	Real Estate Sales Agents	80	90	12.5	2	$23,689	7
43-3071	Tellers	640	680	6.3	30	$22,747	11
39-9032	Recreation Workers	590	590	0.0	11	$20,385	5

The following table indicates the distribution of high, mid & low wage jobs projected for Investment Support Services from 2008 to 2018.

Wage Ranges	
Higher Wage	24%
Mid-Range Wage	45%
Lower Wage	31%

SOC Code	Occupation Title	Annual Average Employment		Employment Change (%)	Avg Annual Job Openings (by # of jobs)[1]	2010 Wages, Median Annual[2]	Education and Training Levels[3]
		2008	2018				
53-7061	Cleaners of Vehicles & Equipment	190	210	10.5	9	$20,204	11
37-2012	Maids & Housekeeping	1,460	1,490	2.1	29	$19,877	11
41-2021	Counter & Rental Clerks	730	790	8.2	26	$19,671	11
43-4071	File Clerks	60	50	-16.7	2	$19,654	11
39-6011	Baggage Porters & Bellhops	30	30	0.0	1	$19,422	11
41-9041	Telemarketers	60	50	-16.7	1	$19,258	11
53-7064	Packers & Packagers	380	370	-2.6	6	$19,067	11
35-3031	Waiters & Waitresses	2,050	2,080	1.5	117	$18,895	11
				TOTAL # JOBS	320		

March 2009 Benchmark

Table includes the self-employed, unpaid family workers, private household workers, & farm employment. Occupations with employment below 30 in 2008 are excluded. Occupation subtotals may not add to the totals due to rounding & the suppression of data. N/A - Information is not available.

[1] Total Jobs are the sum of new jobs & replacement needs.

[2] Annual Wages are the estimated 50th percentile of the distribution of wages; 50% of workers in an occupation earn wages below, & 50% earn wages above the median wage. The wages are from 2010-1st quarter & do not include self-employed or unpaid family workers.

[3] Occupational training & education classifications were developed by the Bureau of Labor Statistics (BLS).

For more information on the classifications, please see the BLS Training Definitions.

1. First Professional Degree - LLD/MD
2. Doctoral Degree
3. Master's Degree
4. Bachelor's Degree or Higher & Some Work Experience
5. Bachelor's Degree
6. Associate Degree
7. Post-Secondary Vocational Education
8. Work Experience in a Related Occupation
9. Long term On-the-Job Training
10. Moderate Term On-the-Job Training
11. Short Term On-the-Job Training

INDUSTRY PROFILE: Management and Innovation Services

Figure 2-13: Management and Innovation Services Performance Summary

Management and Innovation Services	1995	2009	Percent Change, 1995 to 2009	Regional Comparison
Employment	1230	2381	93.6%	-6.1%
Firms	274	382	39.4%	-15.5%
Wages	$34,501	$43,940	27.4%	6.7%
Concentration	0.31	0.41	32.3%	N/A

The Management and Innovation Services industry cluster is a rapidly growing cluster of professional assistance focused on helping businesses communicate, develop and implement products, and process innovations. The major sectors include:

- Telecommunications—including cable and satellite television distribution services, internet access and telecommunications support services. The sector is primarily engaged in operating, and/or providing access to facilities for the transmission of voice, data, text, sound and video. The industry subsectors are distinguished by the type of infrastructure operated.
- Information Services—including data processing, hosting, and related services. Sector industries provide the infrastructure for hosting and/or data processing services. Subsector establishments store and provide access to information, operate Web sites that use search engines to allow for searching information on the Internet, or publish and/or broadcast content exclusively on the Internet.

Examples: Redwood Coast businesses that fall under the category of Management and Innovation Services

- Engineering and Design Services—including the application of physical laws and principles of engineering in the design, development, and utilization of machines, materials, instruments, structures, processes and systems.
- Scientific/Technical Consulting Services—including advice and assistance to businesses and other organizations on designs and specifications that optimize the use, value and appearance of their products.
- Research and Development in the Physical, Engineering, and Life Sciences— including research and development in the physical, engineering, and life sciences, such as agriculture, electronics, environmental, biology, botany, biotechnology, computers, chemistry, food, fisheries, forests, geology, health, mathematics, medicine, oceanography, pharmacy, physics, veterinary and other allied subjects.

The Management and Innovation Services industry is the fifth largest and fastest growing Target of Opportunity, employing 2,381 across the five county region in 2009. It has added jobs at a much faster rate (93.6%) than the state average, almost doubling in size over the period.

The cluster offers the highest wages among all Targets, paying an average that is 47% higher than the regional average of $29,794. The average wages also grew at a much faster rate (27.4%) than the regional average of .3%. Moreover, the total number of cluster firms increased by 39.4% between 1995 and 2009, which is significantly higher than the region's growth rate (-15.5%). The sector is small but increasing in concentration from .31 to .41 in comparison to California.

A closer look at the industry groups comprising Management and Innovation Services (see Fig. 2-14) reveals that:

- The biggest employers are architectural, engineering and specialized design services; computer systems design and scientific and technical consulting services; scientific research and development; and other professional, scientific and technical services. These three combined industry groups comprise almost 80% of the cluster's total employment.
- Computer systems design and scientific and technical consulting services increased jobs from 230 to 800 from 1995 to 2009, moving the industry sector from mid-sized to the largest within the cluster.
- All Management and Innovation industry sectors experienced positive annual average job growth over the period, averaging increases between 1.1% and 10.2%.

Figure 2-14: Management and Innovation Services Performance Detail

NAICS Code	Industry Sector (NAICS Title)	Regional Average Employment		Annual Average Growth Rate	Average Annual Wage ($ECI ADJ)	Average Annual Wage	Total Establishments			Regional Employment Concentration	
		1995	2009		1995	2009	1995	2009	% Change	1995	2009
5171 5172	Wired & Wireless Telecommunications	103	269	6.2%	$54,724	$52,707	11	29	163.6%	0.55	0.61
5174 5179	Other Telecommunications	42	199	10.2%	$67,095	$64,200	4	24	500.0%	0.33	0.65
5182 5191	Data Processing, Hosting, & Other Information Services	26	31	1.1%	$31,631	$35,047	3	7	133.3%	0.11	0.09
5413 5414	Architectural, Engineering, & Specialized Design Services	448	580	1.6%	$39,412	$45,264	107	96	-10.3%	0.41	0.50
5415 5416	Computer Systems Design & Scientific & Technical Consulting Services	230	800	8.1%	$33,079	$45,526	74	160	116.2%	0.18	0.33
5417 5419	Scientific R&D & Other Professional, Scientific, & Technical Services	381	502	1.7%	$20,719	$27,703	75	66	-12.0%	0.38	0.44

Industry Drivers and Opportunities for Management and Innovation Services

The Management and Innovation Services industry cluster can be grouped into three types of firms:

- Small firms of 1-2 people who earn an acceptable income, have sufficient work and do not wish to "grow" their business
- Medium-sized firms with three to fifteen employees that frequently team with smaller and larger firms for projects
- Large firms that have the capacity and expertise to lead large projects and serve clients globally

Firms of each type compete and serve clients locally, statewide, nationally and internationally. The small and some of the medium-size firms generally have sufficient business and do not seek growth. Some of the medium-sized and the larger firms are highly competitive and growing.

California is one of the most regulated places in the world, which means that state and federal permit requirements drive much of the work in this industry cluster. These requirements pushed the development of local expertise in environmental protection and analysis, habitat restoration, water and wastewater infrastructure design. This expertise is exportable and has become a competitive advantage internationally. As standards rise, they will continue to drive a market for technical expertise that meets and exceeds the requirements outlined by environmental regulation. The energy industry and state and federal policies regarding greenhouse gas emissions will also drive growth in technical solution companies.

Humboldt State University (HSU) has a very strong environmental engineering program, which provides exceptional young talent to locally based engineering and environmental consulting firms working on local, national and international projects.

Attracting and retaining talented workforce is a key driver for this knowledge-based industry. Fortunately the Redwood region, with abundant natural resources and recreational opportunities, retains some HSU graduates and can attract talented employees.

Business-to-business service providers offering technical expertise, such as Internet and communications technology, on-line streaming, process design and facilitation. Human resources is also in this sector. Many of these firms are small and medium-sized, highly entrepreneurial and competitive in specialized national markets (see table: Occupational Employment Projections).

Strategic Work Plan for Management and Innovation Services

This is an emerging industry and many businesses within the industry do not recognize that they share an industry. Business owners, executives and consultants met to review industry data and share perspectives on industry formation, evolution, challenges and opportunities. Business leaders were also interviewed one-on-one and in small groups (employees from one larger company). Gregg Foster, then of Redwood Region Economic Development Commission, Maggie Gainer of Gainer & Associates, and Nicole Morrow of Humboldt County Economic Development Division convened and facilitated these meetings and interviews. Jacqueline Debets then combined the input from these sources to produce the following strategic work plan for Management and Innovation Services.

Key Issues:

A) Limited access to talented workforce

B) Regulatory complexity

C) Need to consider local talent for projects put out to bid

Assets

A) Quality of life attracts talented people to live here

Quick Wins

A) Local preference policy

Strategy A

Attract and Retain Knowledgeable, Talented People

Project 1A. Encourage HSU graduates to stay and return

Project 2A. Make meaningful connections to HSU students early & provide mentoring

Project 3A. Market Humboldt as a place of knowledgeable talent and encourage graduates to bring their experience back to Humboldt

Project 4A. Expand trails and other natural amenity access points

Project 5A. Support incoming, relocating employees by helping their spouses find employment

Project 6A. Explore/offer benefit trade-offs for employees (flex time/childcare) to increase employee loyalty when cash flow doesn't allow for raises

Project 7A. Increase real-world experience and expectations of students in science and technical fields

Project 8A. Provide courses or experiences in high schools to build understanding of the industry and career opportunities

Strategy B

Build Infrastructure that Supports Reliable, Affordable Communications and People Moving

Project 1B. Expand airport service to more airports

Project 2B. Extend high-speed Broadband connectivity

Strategy C

Increase Competitiveness of Local Firms

Project 1C. Provide industry-driven, specialized value-added meetings/trainings

Project 2C. Provide RFP training (i.e., savvy bid writing, making the most of the regional specialties, RFP law and bidders rights)

Project 3C. Support peer group partnership activities to provide opportunities to bid and work together on large projects

Project 4C. Support more successful collaborations between firms to earn competitive advantage

Project 5C. Increase understanding of cluster- the sectors within and connections among local firms

Project 6C. Provide support for self-employment firms by identifying low cost areas to lease and providing assistance with business filings.

Strategy D

Decrease Regulatory Complexity and Increase Clarity

Project 1D. Increase clarity at early stage of projects so that firms understand the steps required & the design needed to achieve permits

Figure 2-15: Management and Innovation Services 2008-2018 Occupational Employment Projections

The following table indicates the distribution of high, mid & low wage jobs projected for Management and Innovation Services from 2008 to 2018.

Wage Ranges	
Higher Wage	26%
Mid-Range Wage	35%
Lower Wage	39%

SOC Code	Occupation Title	Annual Average Employment		Employment Change (%)	Avg Annual Job Openings (by # of jobs)[1]	2010 Wages, Median Annual[2]	Education and Training Levels[3]
		2008	2018				
11-2021	Marketing Managers	30	40	33.3	1	$105,352	4
11-1011	Chief Executives	280	270	-3.6	8	$105,327	4
11-9199	Managers, All Other	290	300	3.4	8	$96,785	8
11-9041	Engineering Managers	50	50	0.0	1	$92,494	4
17-2051	Civil Engineers	250	260	4.0	5	$91,616	5
11-9021	Construction Managers	160	180	12.5	3	$89,509	5
11-3051	Industrial Prod Managers	80	80	0.0	3	$89,332	5
17-2071	Electrical Engineers	30	40	33.3	2	$87,381	5
19-3031	Clinical Counseling Psychologists	130	130	0.0	4	$86,213	2
11-9121	Natural Sciences Managers	40	40	0.0	1	$84,662	4
11-9111	Medical & Health Services Managers	300	320	6.7	8	$81,713	4
17-2081	Environmental Engineers	40	50	25.0	2	$80,579	5
27-1011	Art Directors	30	30	0.0	1	$77,947	4
11-3071	Trans, Storage, Distribution Mgrs	50	40	-20.0	1	$76,623	8
11-3021	Computer, Info Systems Mgrs	60	60	0.0	1	$76,218	4
11-1021	General, Operations Mgrs	1,390	1,390	0.0	40	$76,125	4
15-1031	Computer Software Engrs, Applications	60	80	33.3	3	$75,180	5
19-2042	Geoscientists	60	60	0.0	3	$73,987	3
29-1111	Registered Nurses	1,650	1,910	15.8	55	$72,083	6
13-2051	Financial Analysts	50	60	20.0	2	$71,334	5
11-2022	Sales Managers	260	310	19.2	11	$70,804	4
19-1023	Zoologists & Wildlife Biologists	90	90	0.0	3	$70,596	3
41-4011	Sales , Manufact, Scientific Products	70	80	14.3	3	$70,423	10

The following table indicates the distribution of high, mid & low wage jobs projected for Management and Innovation Services from 2008 to 2018.

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Higher Wage	26%
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Lower Wage	39%

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		2008	2018				
11-3041	Compensation, Benefits Mgers	30	30	0.0	1	$70,096	4
29-2011	Med, Clinical Lab Technologists	50	50	0.0	1	$69,917	5
47-1011	Sups, Managers Construction Trades	370	410	10.8	11	$69,425	8
19-1042	Med Scientists, Not Epidemiologists	40	50	25.0	2	$69,041	2
15-1051	Computer Systems Analysts	90	100	11.1	3	$68,688	5
11-3031	Financial Managers	330	360	9.1	8	$68,070	4
23-1011	Lawyers	240	260	8.3	7	$67,770	1
19-3051	Urban & Regional Planners	100	100	0.0	2	$63,178	3
13-1031	Claims Adjusters, Investigators	60	60	0.0	2	$63,007	9
25-9031	Instructional Coordinators	200	220	10.0	6	$62,863	3
13-2072	Loan Officers	70	80	14.3	2	$62,575	5
45-1011	Managers, Farming, Fishing, Forestry	230	250	8.7	8	$60,091	8
19-1032	Foresters	70	70	0.0	1	$59,458	5
19-1029	Biological Scientists, All Other	70	70	0.0	2	$59,348	5
51-1011	Mgrs, Production, Operating Workers	280	280	0.0	4	$59,171	8
11-3061	Purchasing Managers	40	40	0.0	1	$58,581	4
49-2022	IT Equip Installers	200	220	10.0	6	$58,571	9
13-2031	Budget Analysts	40	50	25.0	1	$58,214	5
49-9052	IT Line Installers & Repairers	130	140	7.7	4	$57,984	9
11-2031	Public Relations Managers	30	30	0.0	1	$57,955	4
15-1061	Database Administrators	40	40	0.0	1	$57,707	5
47-2111	Electricians	180	190	5.6	5	$55,912	9
13-1051	Cost Estimators	110	140	27.3	5	$55,722	5
49-1011	Mgr, Mechanics, Installers, Repairers	260	270	3.8	8	$55,330	8

The following table indicates the distribution of high, mid & low wage jobs projected for Management and Innovation Services from 2008 to 2018.

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		2008	2018				
15-1081	Network Systems Data Analysts	110	160	45.5	7	$54,172	5
41-1012	Line Sups/Mgrs, Non-Retail Sales	180	190	5.6	5	$53,686	8
19-2041	Envir. Scientists, Including Health	180	210	16.7	8	$53,232	5
17-3031	Surveying, Mapping Technicians	80	90	12.5	2	$52,432	10
13-1111	Management Analysts	540	620	14.8	17	$52,391	4
21-1012	Edl, Voc, & School Counselors	310	330	6.5	7	$51,640	3
15-1071	Network, Comp System Admin.	130	140	7.7	3	$50,768	5
17-3011	Architectural, Civil Drafters	80	80	0.0	2	$50,695	7
25-3099	Teachers & Instructors, All Other	650	690	6.2	14	$50,309	5
13-2011	Accountants & Auditors	530	610	15.1	17	$50,289	5
17-3022	Civil Engineering Technicians	70	70	0.0	1	$50,145	6
11-3011	Administrative Services Managers	190	190	0.0	4	$49,964	4
13-2052	Personal Financial Advisors	70	90	28.6	3	$49,859	5
13-1079	Human Resources, Labor Specialists	60	70	16.7	3	$49,496	5
13-1073	Training & Devel Specialists	80	90	12.5	3	$49,416	5
13-1072	Comp Benefits, Job Specialists	50	60	20.0	2	$49,017	5
47-4011	Construction, Bldg Inspectors	70	70	0.0	1	$48,877	8
13-1023	Buyers, not Wholesale	90	100	11.1	3	$47,739	5
25-4021	Librarians	90	90	0.0	2	$47,678	3
19-4091	Envir Science, Technicians	90	100	11.1	6	$47,588	6
41-4012	Sales Reps, Wholesale	500	540	8.0	17	$47,546	10
19-3021	Market Research	70	80	14.3	4	$47,520	3

The following table indicates the distribution of high, mid & low wage jobs projected for Management and Innovation Services from 2008 to 2018.

Wage Ranges	
Higher Wage	26%
Mid-Range Wage	35%
Lower Wage	39%

SOC Code	Occupation Title	Annual Average Employment		Employment Change (%)	Avg Annual Job Openings (by # of jobs)[1]	2010 Wages, Median Annual[2]	Education and Training Levels[3]
		2008	2018				
13-1071	Employment, Placement Specs.	50	60	20.0	2	$47,059	5
19-1013	Soil & Plant Scientists	50	50	0.0	2	$47,043	5
27-2012	Producers & Directors	30	30	0.0	1	$46,983	4
21-1023	Ment. Health, Sub. Abuse Workers	180	180	0.0	5	$46,784	3
47-2073	Operating Engineers	400	420	5.0	9	$46,760	10
33-1099	Mgrs, Protective Services Workers	70	70	0.0	3	$45,871	8
41-3099	Sales Reps, Services	130	140	7.7	5	$45,626	10
13-1041	Compliance Officers, not Agric, Const, Health, Transport.	150	180	20.0	5	$45,528	9
				TOTAL # JOBS	424		
17-1011	Architects, Except Landscape & Naval	40	40	0.0	1	$44,520	5
23-2011	Paralegals & Legal Assistants	100	110	10.0	2	$44,299	6
13-1199	Business Ops Specialists	770	820	6.5	22	$43,727	5
43-1011	Mgrs Office Admin Support Workers	1,160	1,240	6.9	34	$42,994	8
41-9099	Sales, Related Workers	110	140	27.3	6	$42,544	10
19-4099	Life, Physical, Social Science Techs	60	60	0.0	3	$42,363	6
43-5061	Production, Planning Clerks	80	90	12.5	3	$41,505	11
51-4041	Machinists	60	60	0.0	1	$40,444	9
51-4121	Welders, Cutters, Solderers, Brazers	140	160	14.3	5	$39,625	7
15-1021	Computer Programmers	50	50	0.0	1	$39,384	5
49-9021	Heating, Air Mechanics	50	50	0.0	2	$39,032	9
53-1021	Mgrs Helpers, Laborers, & Material Movers, Hand	90	100	11.1	3	$38,400	8
53-7051	Industrial Truck & Tractor Operators	420	460	9.5	16	$38,252	11

The following table indicates the distribution of high, mid & low wage jobs projected for Management and Innovation Services from 2008 to 2018.

Wage Ranges	
Higher Wage	26%
Mid-Range Wage	35%
Lower Wage	39%

SOC Code	Occupation Title	Annual Average Employment		Employment Change (%)	Avg Annual Job Openings (by # of jobs)[1]	2010 Wages, Median Annual[2]	Education and Training Levels[3]
		2008	2018				
53-3032	Truck Drivers, Heavy & Tractor-Trailer	1,360	1,450	6.6	33	$38,070	10
43-6012	Legal Secretaries	190	190	0.0	3	$37,567	7
41-1011	Managers, Retail Sales Workers	1,710	1,870	9.4	53	$36,962	8
43-6011	Executive Secs., Admin Assistants	1,060	1,130	6.6	22	$36,768	10
29-2012	Medical Clinical Lab Technicians	80	80	0.0	3	$36,251	6
43-3061	Procurement Clerks	80	90	12.5	3	$36,137	11
43-4161	HR Assistants, Except Payroll	130	110	-15.4	4	$36,131	11
15-1041	Computer Support Specialists	250	260	4.0	8	$36,078	6
27-1024	Graphic Designers	130	140	7.7	5	$36,042	5
43-3011	Bill-Account Collectors	110	130	18.2	4	$36,030	11
27-3043	Writers & Authors	50	50	0.0	1	$35,968	5
33-9099	Protective Service Workers, All Other	320	310	-3.1	22	$35,881	11
43-9011	Computer Operators	70	50	-28.6	1	$35,779	10
19-4093	Forest & Conservation Technicians	280	280	0.0	13	$35,013	6
25-4031	Library Technicians	110	110	0.0	5	$34,855	11
51-5023	Printing Machine Operators	90	70	-22.2	2	$34,372	10
31-9099	Healthcare Support Workers, All Other	150	160	6.7	3	$34,304	11
43-3051	Payroll & Timekeeping Clerks	280	250	-10.7	7	$34,042	10
47-2061	Construction Laborers	1,070	1,190	11.2	19	$33,493	10
43-3031	Bookkeeping, Auditing Clerks	2,000	2,130	6.5	37	$33,420	10
11-9141	Property, Community Association Managers	420	440	4.8	9	$33,236	5
43-4111	Interviewers, not Eligibility, Loan	180	200	11.1	7	$32,134	11

The following table indicates the distribution of high, mid & low wage jobs projected for Management and Innovation Services from 2008 to 2018.

Wage Ranges	
Higher Wage	26%
Mid-Range Wage	35%
Lower Wage	39%

SOC Code	Occupation Title	Annual Average Employment		Employment Change (%)	Avg Annual Job Openings (by # of jobs)[1]	2010 Wages, Median Annual[2]	Education and Training Levels[3]
		2008	2018				
29-2056	Veterinary Technologists & Techs	110	130	18.2	5	$31,951	6
53-3033	Truck Drivers, Light or Delivery Services	650	740	13.8	20	$31,859	11
43-9022	Word Processors & Typists	70	60	-14.3	1	$31,779	10
49-9099	Installation, Maint., Repair Workers	150	160	6.7	3	$30,900	10
49-9042	Maintenance, Repair Workers, General	1,190	1,290	8.4	28	$30,717	9
37-3011	Landscaping Workers	1,680	1,840	9.5	36	$30,279	11
21-1099	Community & Social Service Specialists	140	160	14.3	4	$30,253	5
19-4031	Chemical Technians	40	40	0.0	1	$30,049	6
43-3021	Billing, Posting Clerks, Machine Operators	390	410	5.1	8	$29,969	10
43-6013	Medical Secretaries	680	750	10.3	16	$29,938	7
43-5111	Measurers, Checkers, Recordkeeping	70	80	14.3	3	$29,800	11
43-9199	Administrative Support Workers	90	70	-22.2	2	$29,358	10
43-6014	Secretaries	990	960	-3.0	13	$29,218	10
43-4151	Order Clerks	130	110	-15.4	4	$29,041	11
27-1026	Merchandise Displayers	50	50	0.0	3	$28,839	10
51-2099	Assemblers & Fabricators, All Other	110	110	0.0	3	$27,918	10
43-9061	Office Clerks, General	2,150	2,240	4.2	38	$26,281	11
43-5071	Shipping, Receiving, & Traffic Clerks	460	440	-4.3	11	$26,246	11
27-3031	Public Relations Specialists	100	120	20.0	4	$26,187	5
43-9021	Data Entry Keyers	70	50	-28.6	1	$25,741	10
27-3022	Reporters & Correspondents	60	60	0.0	2	$25,586	4
27-3091	Interpreters & Translators	70	80	14.3	3	$25,368	9
				TOTAL # JOBS	572		

The following table indicates the distribution of high, mid & low wage jobs projected for Management and Innovation Services from 2008 to 2018.

Wage Ranges	
Higher Wage	26%
Mid-Range Wage	35%
Lower Wage	39%

SOC Code	Occupation Title	Annual Average Employment		Employment Change (%)	Avg Annual Job Openings (by # of jobs)[1]	2010 Wages, Median Annual[2]	Education and Training Levels[3]
		2008	2018				
43-4171	Receptionists & Information Clerks	700	740	5.7	23	$24,997	11
37-2011	Janitors, Cleaners, except Maids	1,350	1,300	-3.7	26	$24,921	11
43-5032	Dispatchers	100	100	0.0	2	$24,571	10
53-7062	Laborers, Freight, Material Movers	1,010	1,060	5.0	37	$24,550	11
43-4121	Library Assistants, Clerical	60	60	0.0	3	$24,119	11
51-9061	Inspectors, Testers, Samplers, Weighers	90	90	0.0	2	$23,866	10
51-2092	Team Assemblers	210	240	14.3	8	$23,373	10
27-4021	Photographers	40	40	0.0	1	$22,959	9
51-9198	Helpers, Production Workers	130	130	0.0	2	$22,192	11
43-5081	Stock Clerks & Order Fillers	1,130	1,250	10.6	38	$21,935	11
41-2011	Cashiers	3,770	4,130	9.5	205	$20,902	11
41-2031	Retail Salespersons	3,580	4,220	17.9	164	$20,840	11
33-9032	Security Guards	630	650	3.2	15	$20,588	11
41-2021	Counter & Rental Clerks	730	790	8.2	26	$19,671	11
43-4071	File Clerks	60	50	-16.7	2	$19,654	11
45-2092	Farmworkers & Laborers	2,660	2,720	2.3	78	$19,477	11
41-9041	Telemarketers	60	50	-16.7	1	$19,258	11
53-7064	Packers & Packagers	380	370	-2.6	6	$19,067	11
				TOTAL # JOBS	639		

March 2009 Benchmark

Table includes the self-employed, unpaid family workers, private household workers, & farm employment. Occupations with employment below 30 in 2008 are excluded. Occupation subtotals may not add to the totals due to rounding & the suppression of data. N/A - Information is not available.

[1] Total Jobs are the sum of new jobs & replacement needs.

[2] Annual Wages are the estimated 50th percentile of the distribution of wages; 50% of workers in an occupation earn wages below, & 50% earn wages above the median wage. The wages are from 2010-1st quarter & do not include self-employed or unpaid family workers.

[3] Occupational training & education classifications were developed by the Bureau of Labor Statistics (BLS).

For more information on the classifications, please see the BLS Training Definitions.

1. First Professional Degree - LLD/MD
2. Doctoral Degree
3. Master's Degree
4. Bachelor's Degree or Higher & Some Work Experience
5. Bachelor's Degree
6. Associate Degree
7. Post-Secondary Vocational Education
8. Work Experience in a Related Occupation
9. Long term On-the-Job Training
10. Moderate Term On-the-Job Training
11. Short Term On-the-Job Training

INDUSTRY PROFILE: Niche Manufacturing

Figure 2-16: Niche Manufacturing Performance Summary

Niche Manufacturing	1995	2009	Percent Change, 1995 to 2009	Regional Comparison
Employment	789	1051	33.2%	-6.1%
Firms	101	99	-2.0%	-15.5%
Wages	$33,501	$42,366	26.5%	6.7%
Concentration	0.18	0.38	1.11%	N/A

The Niche Manufacturing industry cluster includes small, specialized producers spread across more than twenty industry sectors. No individual sector employs more than a few hundred people. Firms in this industry cluster are involved in metal components, coatings, glass, machinery and other products. These firms are growing operations and, according to a focus group of industry leaders, already experiencing labor shortages in key skill occupations that could affect their ability to continue expanding in the region.

Although Niche Manufacturing is the smallest of the Targets of Opportunity, employing 1,051 across the five-county region, it has grown rapidly, adding jobs at a significant rate (+33.2%) in comparison to the region as a whole (-6.1%). The cluster pays an average wage ($42,366) that is over 42% higher than the regional average of $29,794. Real wages also grew at a much faster rate (+26.5%) than the regional average of 6.7%. The number of Niche Manufacturing firms decreased by only 2.0% between 1995 and 2009, in comparison to the region's firm decline of 15.5%. Niche Manufacturing has increased concentration from .18 to .38 of the California average over the 14-year study period.

Examples: Redwood Coast businesses that fall under the category of Niche Manufacturing

Much of the competitiveness in the Niche Manufacturing industry cluster comes from products that are considered high quality and command a higher price in the market, which helps manufacturers overcome the higher costs of transportation in the Redwood Coast region. A closer look at the industry groups comprising Niche Manufacturing (see Fig. 2-17) reveals that:

- The biggest sector is metal and machinery product manufacturers—especially fabricated metal and architectural and structural metal products—as well as related activities such as coating, engraving, heat treating, machine shops, turned product, and screw, nut, and bolt manufacturing.
- The second largest sector involves manufacturing products with other materials including plastics and glass—as well as paint, coatings and adhesives.
- The third largest manufacturing sector is a miscellaneous category that includes jewelry, sporting goods, games, office supply, musical instruments and other products. Real wages nearly doubled between 1995 and 2009, increasing from a level below the regional average to above and jobs increased 45% during this period.

Figure 2-17: Niche Manufacturing Performance Detail

NAICS Code	Industry Sector (NAICS Title)	Regional Average Employment		Annual Average Growth Rate	Average Annual Wage ($ECI ADJ)	Average Annual Wage	Total Establishments			Regional Employment Concentration	
		1995	2009		1995	2009	1995	2009	% Change	1995	2009
3251 3255 3259	Chemical & Other Chemical Product Manufacturing	40	50	1.4%	$40,371	$34,357	4	5	25.0%	0.21	0.45
3261 3272	Plastics & Glass Product Manufacturing	14	65	10.1%	$30,115	$33,550	8	6	-25.0%	0.02	0.21
3323 3324	Structural Metals, Boiler, Tank, & Shipping Container Manufacturing	53	65	1.3%	$39,374	$39,181	7	8	14.3%	0.16	0.29
3326 3327	Spring & Wire Products & Machine Shop Manufacturing	131	85	-2.7%	$37,584	$45,265	19	15	-21.1%	0.37	0.31
3328 3329	Coating & Allied Activities & Other Fabricated Metal Product Manufacturing	203	197	-0.2%	$38,196	$47,556	7	6	-14.3%	0.56	0.95
3331 3399	Agriculture, Construction, & Misc Machinery Manufacturing	128	159	1.4%	$24,538	$38,342	18	15	-16.7%	0.32	0.63
3351 3352 3353	Lighting, Appliance, & Electrical Equipment Manufacturing	61	52	-1.0%	$25,920	$36,852	4	7	75.0%	0.31	0.44
3363 3364	Motor Vehicle Parts & Aerospace Parts Manufacturing	9	69	13.6%	$35,299	$45,226	3	8	166.7%	0.01	0.12
4236 4237	Electrical, Hardware, Plumbing & Heating Wholesalers	39	148	8.7%	$40,551	$41,324	9	15	66.7%	0.07	0.33
4239	Misc. Durable Goods Merchant Wholesalers	111	161	2.2%	$27,123	$47,305	22	14	-36.4%	0.33	0.59

Industry Drivers and Opportunities for Niche Manufacturing

Strong relationships among leaders in Niche Manufacturing and the resulting social capital provide the foundation for this highly entrepreneurial industry cluster. Business owners are tightly networked and draw on each other for mentoring, advice, staffing and vendor referrals. The Redwood Coast region lifestyle provides a strong incentive for entrepreneurs to locate and expand here.

Unfortunately, finding and retaining talented employees to support company growth and implement succession planning remains a challenge. This has significant impact as it limits expansion and additional entrepreneurship.

Many international markets drive growth in the Niche Manufacturing industry cluster. Companies are highly competitive in specialized markets and most do not compete with each other in the region. Over 90% of most company's customers live outside the region and the value of the U.S. dollar is a significant driver for internationally competitive companies. Companies in this sector grew even during the U.S. recession.

The distance from major markets and high transportation costs do limit the number of products that can be cost-effectively manufactured in the region. As a result, the most competitive and profitable locally produced products are light and command a premium price, like jewelry, or rely on raw materials native to the area. These companies are nimble and can often customize products as needed. As companies grow, they tend to move their heavier, transportation-dependent manufacturing out of the region and keep the design, marketing and custom manufacturing here.

Niche Manufacturing Strategic Work Plan

Business owners and executives in Niche Manufacturing, primarily in Humboldt County, met three times with Don Ehnebuske of Redwood Region Economic Development Commission to discuss the challenges and opportunities of their industry. The following work plan is based on those discussions.

Key Issues

A) Improve infrastructure for moving goods and people

B) Expand training for new and existing workforce

C) Increase access to short term capital

D) Develop methods of sharing key information among local businesses

E) Expand sales and marketing tools and opportunities

Assets

A) Quality of life attracts talented people to live here (e.g. lack of commute, air quality, access to natural amenities, etc.)

Quick Wins

A) Develop line of credit program with economic development lenders and local banks

B) Compile list of ongoing workforce training opportunities and distribute to businesses

C) Develop new topical workshops

D) Create online network of local businesses to exchange resource contacts and information

E) Expand use of local branding sales & marketing programs

Strategy A

Improve Access to Transportation

Project 1A. Attract appropriate commercial carrier to ACV

Project 2A. Explore charter air services

a) Contact Redding charter service

Project 3A. Facilitate interstate truck access on US 101

Project 4A. Facilitate interstate truck access on HWY 299

Strategy B

Improve Access to Short Term Capital

Project 1B. Establish a line of credit program with local economic development lenders

Strategy C

Expand Workforce Skills

Project 1C. Compile list of ongoing training programs and distribute to local businesses

a) Contact Eureka Adult School, SBDC, OSHA & other entities to compile list

Project 2C. Support Decade Of Difference efforts

Project 3C. Expand middle management training opportunities

a) Provide training in supervisory skills for newly promoted individuals
b) Add refreshers for more seasoned individuals
c) Provide workplace conflict management training
d) Provide motivational (success story) sessions for existing staff

Project 4C. Expand owner & senior management training opportunities

a) Promote use of existing or customized training opportunities such as Cascadia, Insight & Strategies, others

Project 5C. Expand topical workshops

a) Provide workshops on strategic sales strategies
b) Provide workshops on owner/management succession strategies
c) Provide workshops on use of online sales & training tools such as training, meetings, virtual tradeshow, one-on-one sales
d) Provide workshops on production management, process control and inventory control techniques
e) Provide workshops on OSHA compliance

Strategy D

Improve Communication Among Niche Manufacturers

Project 1D.Establish an online network of regional manufacturers to facilitate simple, quick information using Linked-In group or other easy to implement format

Project 2D. Expand peer-to-peer opportunities to discuss common issues among owners and management

Project 3D. Facilitate cross promotion among local manufacturers

Strategy E

Increase Use of Regional Branding, Marketing, and Sales

Project 1E. Expand use of the Humboldt Made brand to more county industries and companies

a) Expand outreach efforts

b) Define goals and structure of Humboldt Made organization

Project 2E. Coordinate use of Convention & Visitors Bureau trade show events

Project 3E. Improve Humboldt County presence at capitol and state fair

Project 4E. Develop publicity strategy to capitalize on media references to the region

Project 5E. Develop publicity strategy to increase statewide and national awareness of Humboldt County's creative businesses

Project 6E. Develop local trade show for high end designer items

Project 7E. Create out of area temporary sales location

Project 8E. Create virtual Humboldt sales location

Jobs in the Niche Manufacturing Industry Cluster

Approximately 1,094 jobs are projected to open in the Niche Manufacturing industry cluster annually through 2018. The majority of the industry jobs are in the mid-wage level (40%), with the remaining occupations spread across the low-wage level (33%) and higher wage level (27%). Higher wage jobs can be entered with a Bachelor's Degree or long term on-the-job training, while mid and low- wage occupations only require moderate to short term on-the-job training. Given the diversity of products and markets, Niche Manufacturing companies generally provide training customized to their market and firm and often promote long term employees into higher wage jobs (see table: Occupational Employment Projections).

Figure 2-18: Niche Manufacturing 2008-2018 Occupational Employment Projections

The following table indicates the distribution of high, mid & low wage jobs projected for Niche Manufacturing from 2008 to 2018.

Wage Ranges	
Higher Wage	27%
Mid-Range Wage	40%
Lower Wage	33%

SOC Code	Occupation Title	Annual Average Employment		Employment Change (%)	Avg Annual Job Openings (by # of jobs)[1]	2010 Wages, Median Annual[2]	Education and Training Levels[3]
		2008	2018				
11-2021	Marketing Managers	30	40	33.3	1	$105,352	4
11-1011	Chief Executives	280	270	-3.6	8	$105,327	4
11-9199	Managers, All Other	290	300	3.4	8	$96,785	8
11-9041	Engineering Managers	50	50	0.0	1	$92,494	4
11-3051	Industrial Prod Managers	80	80	0.0	3	$89,332	5
17-2071	Electrical Engineers	30	40	33.3	2	$87,381	5
11-3071	Trans, Storage, Distribution Mgrs	50	40	-20.0	1	$76,623	8
11-3021	Computer and Info Systems Managers	60	60	0.0	1	$76,218	4
11-1021	General and Operations Mgrs	1,390	1,390	0.0	40	$76,125	4
15-1031	Computer Software Enginrs	60	80	33.3	3	$75,180	5
13-2051	Financial Analysts	50	60	20.0	2	$71,334	5
11-2022	Sales Managers	260	310	19.2	11	$70,804	4
41-4011	Sales Reps, Whlsle, Technical Prods.	70	80	14.3	3	$70,423	10
47-1011	Mgrs Construction Trades, Extraction	370	410	10.8	11	$69,425	8
15-1051	Comp Systems Analysts	90	100	11.1	3	$68,688	5
11-3031	Financial Managers	330	360	9.1	8	$68,070	4
23-1011	Lawyers	240	260	8.3	7	$67,770	1

The following table indicates the distribution of high, mid & low wage jobs projected for Niche Manufacturing from 2008 to 2018.

Wage Ranges	
Higher Wage	27%
Mid-Range Wage	40%
Lower Wage	33%

SOC Code	Occupation Title	Annual Average Employment		Employment Change (%)	Avg Annual Job Openings (by # of jobs)[1]	2010 Wages, Median Annual[2]	Education and Training Levels[3]
		2008	2018				
51-1011	Mgrs Prod Operating Workers	280	280	0.0	4	$59,171	8
11-3061	Purchasing Managers	40	40	0.0	1	$58,581	4
49-2022	Telecom Equip Installers, Repair	200	220	10.0	6	$58,571	9
13-2031	Budget Analysts	40	50	25.0	1	$58,214	5
49-9052	Telecom Line Installers, Repairers	130	140	7.7	4	$57,984	9
15-1061	Database Administrators	40	40	0.0	1	$57,707	5
47-2111	Electricians	180	190	5.6	5	$55,912	9
13-1051	Cost Estimators	110	140	27.3	5	$55,722	5
49-1011	Mgrs Mechanics, Installers, Repairers	260	270	3.8	8	$55,330	8
15-1081	Network Syst Data Communications	110	160	45.5	7	$54,172	5
41-1012	Managers, Non-Retail Sales	180	190	5.6	5	$53,686	8
13-1111	Management Analysts	540	620	14.8	17	$52,391	4
15-1071	Network Computer Systems Admin	130	140	7.7	3	$50,768	5
13-2011	Accountants and Auditors	530	610	15.1	17	$50,289	5
49-9041	Indus. Mechanics	60	60	0.0	2	$50,101	9
11-3011	Admin Svs Managers	190	190	0.0	4	$49,964	4
53-1031	Mgrs Trans Material-Moving	120	110	-8.3	2	$49,885	8
13-1079	HR Training, and Labor Relations	60	70	16.7	3	$49,496	5
13-1073	Training, Develpmt Specialists	80	90	12.5	3	$49,416	5
13-1072	Compensation, Benefits Specialists	50	60	20.0	2	$49,017	5
47-2152	Plumbers, Steamfitters	310	340	9.7	9	$48,582	9
13-1023	Buyers	90	100	11.1	3	$47,739	5
41-4012	Sales Rep , Wholesale	500	540	8.0	17	$47,546	10
19-3021	Market Research	70	80	14.3	4	$47,520	3
47-2051	Cement Masons,Concrete Finishers	140	140	0.0	4	$46,813	9

The following table indicates the distribution of high, mid & low wage jobs projected for Niche Manufacturing from 2008 to 2018.

Wage Ranges	
Higher Wage	27%
Mid-Range Wage	40%
Lower Wage	33%

SOC Code	Occupation Title	Annual Average Employment		Employment Change (%)	Avg Annual Job Openings (by # of jobs)[1]	2010 Wages, Median Annual[2]	Education and Training Levels[3]
		2008	2018				
49-3042	Heavy Equip Mechanics	140	150	7.1	4	$46,774	7
47-2073	Op Engineers, Equip Operators	400	420	5.0	9	$46,760	10
49-9043	Maintenance Wrks, Machinery	70	70	0.0	1	$46,612	9
47-2031	Carpenters	1,120	1,170	4.5	20	$46,496	9
51-9122	Painters, Trans Equipment	40	40	0.0	2	$45,820	10
41-3099	Sales Reps, Services	130	140	7.7	5	$45,626	10
13-1041	Compliance Officers	150	180	20.0	5	$45,528	9
				TOTAL # JOBS	296		
13-1199	Business Ops Specialists	770	820	6.5	22	$43,727	5
43-1011	Mgrs. Admin Support Workers	1,160	1,240	6.9	34	$42,994	8
41-9099	Sales, Related Workers, All Other	110	140	27.3	6	$42,544	10
49-3031	Bus and Truck Mechanics	250	270	8.0	8	$41,915	7
43-5061	Production, Planning, Clerks	80	90	12.5	3	$41,505	11
51-4041	Machinists	60	60	0.0	1	$40,444	9
47-2211	Sheet Metal Workers	70	70	0.0	2	$39,933	10
51-4121	Welders, Cutters, Solderers, Brazers	140	160	14.3	5	$39,625	7
15-1021	Computer Programmers	50	50	0.0	1	$39,384	5
49-9021	Heating, Air Mechanics	50	50	0.0	2	$39,032	9
53-1021	Mgrs. Helpers, Laborers, Movers	90	100	11.1	3	$38,400	8
53-7051	Industrial Truck and Tractor Operators	420	460	9.5	16	$38,252	11
53-3032	Truck Drivers, Tractor-Trailer	1,360	1,450	6.6	33	$38,070	10
43-6011	Exec Secretaries, Admin Assistants	1,060	1,130	6.6	22	$36,768	10
13-1022	Wholesale and Retail Buyers,	160	160	0.0	5	$36,384	5
43-3061	Procurement Clerks	80	90	12.5	3	$36,137	11
43-4161	Human Resources Assistants	130	110	-15.4	4	$36,131	11

The following table indicates the distribution of high, mid & low wage jobs projected for Niche Manufacturing from 2008 to 2018.

Wage Ranges	
Higher Wage	27%
Mid-Range Wage	40%
Lower Wage	33%

SOC Code	Occupation Title	Annual Average Employment		Employment Change (%)	Avg Annual Job Openings (by # of jobs)[1]	2010 Wages, Median Annual[2]	Education and Training Levels[3]
		2008	2018				
15-1041	Computer Support Specialists	250	260	4.0	8	$36,078	6
27-1024	Graphic Designers	130	140	7.7	5	$36,042	5
43-3011	Bill and Account Collectors	110	130	18.2	4	$36,030	11
43-3051	Payroll and Timekeeping Clerks	280	250	-10.7	7	$34,042	10
47-2061	Construction Laborers	1,070	1,190	11.2	19	$33,493	10
43-3031	Bookkeeping, Acct. Auditing Clerks	2,000	2,130	6.5	37	$33,420	10
51-4031	Cutting, Punching Machine Setters,	50	40	-20.0	1	$31,897	10
53-3033	Truck Drivers, Light or Delivery Services	650	740	13.8	20	$31,859	11
49-9099	Installation, Maint. Repair Workers,	150	160	6.7	3	$30,900	10
49-9042	Maintenance, Repair Workers,	1,190	1,290	8.4	28	$30,717	9
51-9023	Mixing, Blending Machine Setters	50	50	0.0	2	$30,594	10
43-3021	Billing and Posting Clerks, Operators	390	410	5.1	8	$29,969	10
43-5111	Weighers, Measurers	70	80	14.3	3	$29,800	11
43-4051	Customer Service Representatives	740	900	21.6	39	$29,619	10
43-9199	Office Admin Support Workers,	90	70	-22.2	2	$29,358	10
43-6014	Secretaries	990	960	-3.0	13	$29,218	10
43-4151	Order Clerks	130	110	-15.4	4	$29,041	11
51-9121	Painting, Spraying Operators, Tenders	40	40	0.0	2	$28,792	10
51-2099	Assemblers and Fabricators	110	110	0.0	3	$27,918	10
53-3031	Driver, Sales Workers	260	260	0.0	6	$27,520	11
43-9061	Office Clerks, General	2,150	2,240	4.2	38	$26,281	11
43-5071	Shipping, Receiving, and Traffic Clerks	460	440	-4.3	11	$26,246	11
27-3031	Public Relations Specialists	100	120	20.0	4	$26,187	5

The following table indicates the distribution of high, mid & low wage jobs projected for Niche Manufacturing from 2008 to 2018.

Wage Ranges	
Higher Wage	27%
Mid-Range Wage	40%
Lower Wage	33%

SOC Code	Occupation Title	Annual Average Employment		Employment Change (%)	Avg Annual Job Openings (by # of jobs)[1]	2010 Wages, Median Annual[2]	Education and Training Levels[3]
		2008	2018				
43-9021	Data Entry Keyers	70	50	-28.6	1	$25,741	10
27-3091	Interpreters and Translators	70	80	14.3	3	$25,368	9
				TOTAL # JOBS	441		
43-4171	Receptionists and Information Clerks	700	740	5.7	23	$24,997	11
37-2011	Janitors, Cleaners,	1,350	1,300	-3.7	26	$24,921	11
43-5032	Dispatchers	100	100	0.0	2	$24,571	10
53-7062	Laborers, Freight, Stock, Movers	1,010	1,060	5.0	37	$24,550	11
51-9061	Inspectors, Testers and Weighers	90	90	0.0	2	$23,866	10
51-2092	Team Assemblers	210	240	14.3	8	$23,373	10
51-9198	Helpers, Production Workers	130	130	0.0	2	$22,192	11
43-5081	Stock Clerks and Order Fillers	1,130	1,250	10.6	38	$21,935	11
41-2031	Retail Salespersons	3,580	4,220	17.9	164	$20,840	11
33-9032	Security Guards	630	650	3.2	15	$20,588	11
51-9111	Packaging, Filling Machine Operators	400	360	-10.0	7	$19,873	11
41-2021	Counter and Rental Clerks	730	790	8.2	26	$19,671	11
51-9071	Jewelers, Precious Stone Workers	40	40	0.0	1	$19,273	7
53-7064	Packers and Packagers, Hand	380	370	-2.6	6	$19,067	11
				TOTAL # JOBS	357		

March 2009 Benchmark

Table includes the self-employed, unpaid family workers, private household workers, & farm employment. Occupations with employment below 30 in 2008 are excluded. Occupation subtotals may not add to the totals due to rounding & the suppression of data. N/A - Information is not available.

[1] Total Jobs are the sum of new jobs & replacement needs.

[2] Annual Wages are the estimated 50th percentile of the distribution of wages; 50% of workers in an occupation earn wages below, & 50% earn wages above the median wage. The wages are from 2010-1st quarter & do not include self-employed or unpaid family workers.

[3] Occupational training & education classifications were developed by the Bureau of Labor Statistics (BLS).

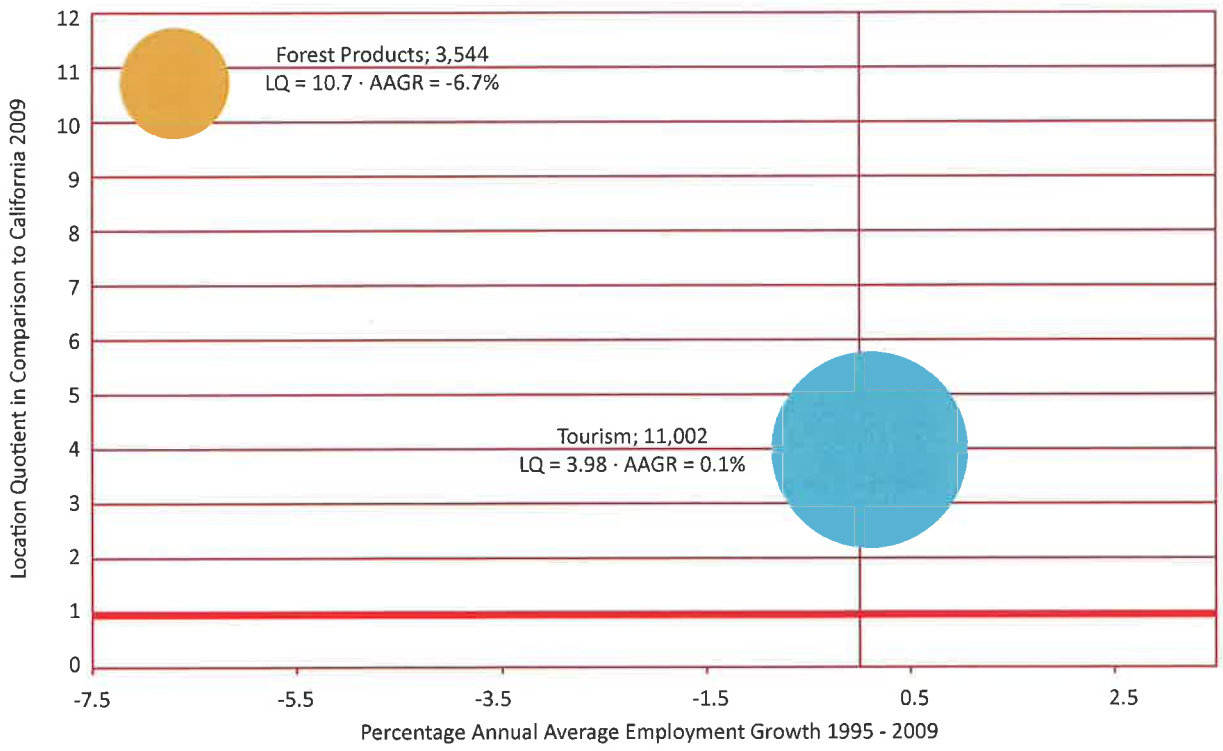
For more information on the classifications, please see the BLS Training Definitions.

1. First Professional Degree - LLD/MD
2. Doctoral Degree
3. Master's Degree
4. Bachelor's Degree or Higher & Some Work Experience
5. Bachelor's Degree
6. Associate Degree
7. Post-Secondary Vocational Education
8. Work Experience in a Related Occupation
9. Long term On-the-Job Training
10. Moderate Term On-the-Job Training
11. Short Term On-the-Job Training

Overview Forest Products and Tourism

While the Tourism and Forest Products industry clusters in the Redwood Coast region comprise distinctly separate and sometimes competing industry groups, they have much in common. Both are fundamentally tied to the area's abundant natural resources and are heavily concentrated (chart below). Tourism is almost four times as concentrated when compared to California as a whole and Forest Products is nearly eleven times more concentrated than in the state as whole. Both industries are also dependent on access to natural resources. The region's abundant parks and forests, pristine coastline and beaches, numerous rivers and other natural and scenic settings contribute to the area's tourist and recreational attraction. Similarly, access to timber has been, and continues to be, the fundamental basis for the existence and competiveness of the Forest Products industry in the region. Both industries are also major economic drivers for the area. Combined, they comprised 14,546 private industry jobs and over $287.5 million in wages in 2009, representing about 17.6 % of the region's total employment and 11.7 % of total wages.

Figure 2-19: Forest Products and Tourism growth and concentration compared to California



Interpreting the chart: The size of the bubble indicates number of jobs. The horizontal axis indicates annual average growth rate over the 1995 – 2008 period. The vertical axis indicates an industry's concentration when compared to California. With respective concentrations of 3.98 and 10.7, Redwood Coast Tourism and Forest Products industries are much more heavily concentrated in the region than in the State as a whole.

INDUSTRY PROFILE: Forest Products

The Redwood Coast region's Forest Products industry cluster is a mature, heavily concentrated mix of related industries that are ultimately tied to the region's rich timber supply. The industry is comprised of timber related and logging enterprises, wood products manufacturing, wholesalers and specialized transportation. A few firms have separate local establishments in multiple market segments, while several are vertically integrated (i.e., forest nurseries, logging and milling). As a whole, the industry has consistently shed jobs over the past five decades. More recently, this mix of industries (table below) lost about 5,800 jobs between 1995 and 2009 and decreased from 10.6% of total regional employment to 4.3% over the 14-year period.

Despite declining employment and regional employment share, Forest Products continues to be one of the region's staple industry groups. While the industry represents just 4.3% of total regional employment, forest products' wages represent 5.6% of the region's total wages. Nine of ten forest products' sectors pay significantly higher than the regional average and average pay ($38,591) is 29% higher than in the region as a whole.

The region is heavily concentrated in Forest Products at a rate that is more than ten and a half times the California average (10.7). Humboldt and Siskiyou are the two highest timber producing counties (BOE 4/8/2011) in the state and the region produced almost half (47%) of the state's total timber harvest in 2010. Forest Products industries comprise some of the region's highest-paying firms and command a steady supply of local job applicants.

Examples: Redwood Coast businesses that fall under the category of Forest Products

Almquist lumber company

Humboldt Redwood

GREEN DIAMOND RESOURCE COMPANY

Joe Costa Trucking Co.

Hambro Group
"Recycling Today For A Greener Tomorrow"

Figure 2-20: Forest Products Performance Detail

NAICS Code	Industry Sector (NAICS Title)	Regional Average Employment 2009	Average Annual Wage 2009	Employment Concentration 1995	Employment Concentration 2009	Compound Annual Growth Rate 1995 - 2009	% of Region Employment 2009
	Total Forest Products	**3,544**	**$38,591**	**13.88**	**10.72**	**-6.7%**	**4.3%**
1131	Timber Tract Operations	8	$20,310	0.00	59.13	-6.7%	0%
1132 1133	Logging, Forest Nurseries & Gathering Forest Products	591	$41,895	51.62	36.62	-6.7%	1%
1153	Support Activities for Forestry	446	$30,060	53.87	40.93	-2.8%	1%
3211	Sawmills & Wood Preservation	1,128	$42,883	49.68	44.73	-6.7%	1%
3212	Veneer, Plywood & Engineered Wood Product Manufacturers	344	$41,532	20.87	18.98	-5.2%	0%
3219 3271	Other Wood, Furniture, & Kitchen Cabinets	355	$30,465	2.69	1.37	-8.1%	0%
4233	Lumber & Other Construction Materials Wholesalers	223	$34,588	1.71	1.78	0.0%	0%
4842	Specialized Freight Trucking	449	$38,239	2.16	1.84	-2.5%	1%

Industry Drivers and Opportunities for Forest Products

The national housing market drives the demand for lumber and the Forest Products industry. Historically, the industry experiences a cycle of ups and downs reflective of the seasons and health of the national economy. As a commodity project, Douglas fir is particularly affected by the national housing market. Redwood remains the premier and specialty product for the region. California buys over 80% of the Redwood produced in the region, making California's economy a significant driving force in the industry.

Redwood has the potential to regain market share for decking and other specialty products in California, based on its beauty, strength, cost and sustainability footprint versus plastic and composite products. Increased demand for Redwood will have a positive effect on the entire industry.

While the region has a skilled and knowledgeable workforce for the industry due to its history in the area, the industry has changed significantly and now uses manufacturing equipment and processes that require computer programming skills. This results in greater safety for workers and increased efficiency, but also demands a higher skilled workforce than in the past.

Additionally, environmental values and regulations require the industry to monitor, evaluate and report in ways that require an advanced-skill workforce. The industry reports significant shortage in skilled trade people, such as electricians, millwrights and heavy equipment operators with forest experience. Recruiting workforce for Forest Products has become an added challenge in light of the declining image of the industry but there is still an opportunity to turn the region's labor force's historical knowledge into modern skills that will strengthen the industry moving forward.

Regulations are a driving force in the Forest Products industry. Outcome-based analysis and streamlining of regulations could lead to greater predictability in the industry and fulfill common desires for protection of water quality, wildlife protection and forest health, as it has in other states and nations.

Strategic Work Plan for the Forest Products Industry Cluster

Industry executives and business owners, primarily from Humboldt County, met in two settings to develop this strategic work plan for the Forest Products industry. Kathy Moxon of Redwood Coast Rural Action convened and facilitated two meetings and those discussions resulted in the first draft of the work plan. Dawn Elsbree of the Headwaters Fund also convened two meetings of industry leaders and additional input was gathered. Information from all meetings was then incorporated into the following strategic work plan for the Forest Products industry.

Key Issues

A) Improve transportation & communications infrastructure for lumber, logs, people and business communications

B) Improve capacity to find and retain workforce

C) Address regulatory burden

Market for milled redwood products

Assets

A) Redwood growing area

Large foundation firms located in region

Quick Wins

A) Develop Line of Credit Program for small non-industrial landowners through Headwaters Fund

B) Improve port handing of Timber and Forest Products

C) Develop a 1/2 time forest economist position at HSU

Strategy A

Improve Access to Transportation

Project 1A. Improve port capacity to handle log and chip export

Project 2A. Facilitate interstate truck access on US 101

Project 3A. Facilitate interstate truck access on HWY 299

Project 4A. Attract appropriate commercial carrier to ACV

Strategy B

Improve Access to Capital

Project 1B. Establish a Line of Credit Program for NTMPs designed to meet landowner needs

Strategy C

Improve Regional Capacity to Attract and Retain Quality Workforce

Project 1C. Develop a program for addressing trailing professional partners

Project 2C. Participate in advisory boards for both HSU and CR Forestry programs

Project 3C. Support vocational trades in high school and CR (welding, mechanics, truck drivers, electronic technicians, etc.)

Strategy D

Proactively Address Regulatory Complexity and its Cost to Industry Without Sacrificing Environmental Outcomes

Project 1D. Develop mechanism for quickly communicating the impact that proposed regulatory changes would have on both the county and the industry

Project 2D. Clarify various agency roles and remove redundancies (at both county & state levels as well as between them)

Project 3D. Move toward outcome-based monitoring and away from reviewing prescriptions on Timber Harvest Plan silviculture prior to approval

Project 4D. Improve predictability, dependability and durability of Non-Industrial Timber Harvest Plans

Strategy E

Increase Access to Markets

Project 1E.
Inventory biomass projects and conduct a comprehensive analysis of issues and opportunities relating to biomass utilization

Project 2E. Integrate biomass utilization in alternative and green energy policies at the state and federal levels

Project 3E. Conduct product development and research in scaled biomass utilization

Project 4E. Address market loss and opportunities for milled redwood

Jobs in the Forest Products Industry Cluster

The Forest Products industry is projected to open 995 jobs annually through 2018. 20% will be in the higher wage range, 43% in the mid-wage and 36% in the lower wage range. Most high wage occupations in the industry require a Bachelor's degree and/or significant work experience in a related field. Mid-wage jobs need moderate to long term on-the-job training and low-wage jobs can be entered with moderate to short term on-the-job training. Increasingly the Forest Products industry needs technically trained workers and professionals (see table: Occupational Employment Projections).

Figure 2-21: Forest Products 2008-2018 Occupational Employment Projections

The following table indicates the distribution of high, mid & low wage jobs projected for Forest Products from 2008 to 2018.

Wage Ranges	
Higher Wage	20%
Mid-Range Wage	43%
Lower Wage	36%

SOC Code	Occupation Title	Annual Average Employment		Employment Change (%)	Avg Annual Job Openings (by # of jobs)[1]	2010 Wages, Median Annual[2]	Education and Training Levels[3]
		2008	2018				
11-1011	Chief Executives	280	270	-3.6	8	$105,327	4
11-3051	Industrial Prod Managers	80	80	0.0	3	$89,332	5
51-8013	Power Plant Operators	130	150	15.4	6	$76,907	9
11-3071	Transportation, Distribution Managers	50	40	-20.0	1	$76,623	8
11-1021	General and Operations Managers	1,390	1,390	0.0	40	$76,125	4
11-2022	Sales Managers	260	310	19.2	11	$70,804	4
47-1011	Mgrs Construction Trades Workers	370	410	10.8	11	$69,425	8
11-3031	Financial Managers	330	360	9.1	8	$68,070	4
19-1032	Foresters	70	70	0.0	1	$59,458	5
47-2111	Electricians	180	190	5.6	5	$55,912	9
13-1051	Cost Estimators	110	140	27.3	5	$55,722	5
49-1011	Mgrs., Mechanics, Installers, Repairers	260	270	3.8	8	$55,330	8
41-1012	Mgers, Non-Retail Sales	180	190	5.6	5	$53,686	8
13-2011	Accountants and Auditors	530	610	15.1	17	$50,289	5
49-9041	Indus. Mechanics	60	60	0.0	2	$50,101	9
53-1031	Mgrs Transp, Material-Moving Operators	120	110	-8.3	2	$49,885	8
47-2152	Plumbers, Pipefitters, and Steamfitters	310	340	9.7	9	$48,582	9
13-1023	Purchasing Agents	90	100	11.1	3	$47,739	5
41-4012	Sales Rep Wholesale and Manufacturing	500	540	8.0	17	$47,546	10

The following table indicates the distribution of high, mid & low wage jobs projected for Forest Products from 2008 to 2018.

Wage Ranges	
Higher Wage	20%
Mid-Range Wage	43%
Lower Wage	36%

SOC Code	Occupation Title	Annual Average Employment		Employment Change (%)	Avg Annual Job Openings (by # of jobs)[1]	2010 Wages, Median Annual[2]	Education and Training Levels[3]
		2008	2018				
51-8031	Waste Treatment Plant, Syst Operators	280	310	10.7	9	$46,792	9
49-3042	Heavy Equip Mechanics	140	150	7.1	4	$46,774	7
49-9043	Maintenance Workers, Machinery	70	70	0.0	1	$46,612	9
47-2031	Carpenters	1,120	1,170	4.5	20	$46,496	9
51-9122	Painters, Trans. Equipment	40	40	0.0	2	$45,820	10
41-3099	Sales Reps, Services	130	140	7.7	5	$45,626	10
				TOTAL # JOBS	203		
13-1199	Business Ops Specialists	770	820	6.5	22	$43,727	5
43-1011	Mgrs Office, Admin Support Workers	1,160	1,240	6.9	34	$42,994	8
41-9099	Sales and Related Workers, All Other	110	140	27.3	6	$42,544	10
49-3031	Bus, Truck Mechanics, Diesel Eng. Specialists	250	270	8.0	8	$41,915	7
43-5061	Production, Planning, and Expediting Clerks	80	90	12.5	3	$41,505	11
47-2141	Painters, Construction and Maintenance	430	430	0.0	7	$40,477	10
51-4041	Machinists	60	60	0.0	1	$40,444	9
51-4121	Welders, Cutters, Solderers, and Brazers	140	160	14.3	5	$39,625	7
53-1021	Mgrs. Helpers, Laborers, Movers	90	100	11.1	3	$38,400	8
53-7051	Industrial Truck and Tractor Operators	420	460	9.5	16	$38,252	11
53-3032	Truck Drivers, Heavy and Tractor-Trailer	1,360	1,450	6.6	33	$38,070	10
45-4021	Fallers	280	240	-14.3	8	$37,782	10
43-6011	Exec Secretaries, Admin Assistants	1,060	1,130	6.6	22	$36,768	10
45-4022	Logging Equipment Operators	250	240	-4.0	7	$36,616	10
45-4023	Log Graders and Scalers	70	70	0.0	2	$36,500	10
13-1022	Wholesale, Retail Buyers	160	160	0.0	5	$36,384	5
43-4161	HR Assistants	130	110	-15.4	4	$36,131	11

The following table indicates the distribution of high, mid & low wage jobs projected for Forest Products from 2008 to 2018.

Wage Ranges	
Higher Wage	20%
Mid-Range Wage	43%
Lower Wage	36%

SOC Code	Occupation Title	Annual Average Employment		Employment Change (%)	Avg Annual Job Openings (by # of jobs)[1]	2010 Wages, Median Annual[2]	Education and Training Levels[3]
		2008	2018				
49-3041	Farm Equipment Mechanics	40	40	0.0	1	$36,074	7
27-1024	Graphic Designers	130	140	7.7	5	$36,042	5
43-3011	Bill and Account Collectors	110	130	18.2	4	$36,030	11
43-3051	Payroll and Timekeeping Clerks	280	250	-10.7	7	$34,042	10
43-3031	Bookkeeping, Acctg, Auditing Clerks	2,000	2,130	6.5	37	$33,420	10
51-4031	Cutting, Punching, Press Machine Setters,	50	40	-20.0	1	$31,897	10
53-3033	Truck Drivers, Light or Delivery Services	650	740	13.8	20	$31,859	11
51-7041	Sawing Machine Setters, Operators	320	350	9.4	9	$31,268	10
49-9099	Installation, Maint., Repair Workers	150	160	6.7	3	$30,900	10
49-9042	Maint., Repair Workers, General	1,190	1,290	8.4	28	$30,717	9
43-3021	Billing, Posting Clerks, Machine Operators	390	410	5.1	8	$29,969	10
43-4051	Customer Service Representatives	740	900	21.6	39	$29,619	10
43-6014	Secretaries, Except Legal, Medical, Exec.	990	960	-3.0	13	$29,218	10
43-4151	Order Clerks	130	110	-15.4	4	$29,041	11
51-7011	Cabinetmakers and Bench Carpenters	70	70	0.0	2	$28,867	9
51-9121	Coating, Painting Machine Operators	40	40	0.0	2	$28,792	10
51-7042	Woodworking Machine Setters, Operators	210	240	14.3	7	$28,595	10
51-2099	Assemblers and Fabricators, All Other	110	110	0.0	3	$27,918	10
43-9061	Office Clerks, General	2,150	2,240	4.2	38	$26,281	11
43-5071	Shipping, Receiving, and Traffic Clerks	460	440	-4.3	11	$26,246	11
47-3012	Helpers--Carpenters	50	50	0.0	2	$25,192	11
				TOTAL # JOBS	430		

The following table indicates the distribution of high, mid & low wage jobs projected for Forest Products from 2008 to 2018.

Wage Ranges	
Higher Wage	20%
Mid-Range Wage	43%
Lower Wage	36%

SOC Code	Occupation Title	Annual Average Employment		Employment Change (%)	Avg Annual Job Openings (by # of jobs)[1]	2010 Wages, Median Annual[2]	Education and Training Levels[3]
		2008	2018				
43-4171	Receptionists and Information Clerks	700	740	5.7	23	$24,997	11
37-2011	Janitors, Cleaners	1,350	1,300	-3.7	26	$24,921	11
43-5032	Dispatchers	100	100	0.0	2	$24,571	10
53-7062	Laborers, Freight, Stock, Material Movers	1,010	1,060	5.0	37	$24,550	11
51-9061	Inspectors, Testers, Sorters, Weighers	90	90	0.0	2	$23,866	10
51-2092	Team Assemblers	210	240	14.3	8	$23,373	10
51-9198	Helpers, Production Workers	130	130	0.0	2	$22,192	11
49-3093	Tire Repairers and Changers	180	200	11.1	6	$22,089	11
43-5081	Stock Clerks and Order Fillers	1,130	1,250	10.6	38	$21,935	11
41-2031	Retail Salespersons	3,580	4,220	17.9	164	$20,840	11
53-7061	Cleaners of Vehicles and Equipment	190	210	10.5	9	$20,204	11
51-9111	Packaging, Filling Machine Operators	400	360	-10.0	7	$19,873	11
41-2021	Counter and Rental Clerks	730	790	8.2	26	$19,671	11
45-2091	Agricultural Equipment Operators	220	220	0.0	6	$19,227	10
53-7064	Packers and Packagers, Hand	380	370	-2.6	6	$19,067	11
				TOTAL # JOBS	362		

March 2009 Benchmark

Table includes the self-employed, unpaid family workers, private household workers, & farm employment. Occupations with employment below 30 in 2008 are excluded. Occupation subtotals may not add to the totals due to rounding & the suppression of data. N/A - Information is not available.

[1] Total Jobs are the sum of new jobs & replacement needs.

[2] Annual Wages are the estimated 50th percentile of the distribution of wages; 50% of workers in an occupation earn wages below, & 50% earn wages above the median wage. The wages are from 2010-1st quarter & do not include self-employed or unpaid family workers.

[3] Occupational training & education classifications were developed by the Bureau of Labor Statistics (BLS).

For more information on the classifications, please see the BLS Training Definitions.

1. First Professional Degree - LLD/MD
2. Doctoral Degree
3. Master's Degree
4. Bachelor's Degree or Higher & Some Work Experience
5. Bachelor's Degree
6. Associate Degree
7. Post-Secondary Vocational Education
8. Work Experience in a Related Occupation
9. Long term On-the-Job Training
10. Moderate Term On-the-Job Training
11. Short Term On-the-Job Training

INDUSTRY PROFILE: Tourism

The Redwood Coast region Tourism industry is comprised of hospitality, amusement and recreation services and amenity providers that include traveler accommodations and eating and dining services. Tourism represents a substantial and growing share of regional employment, increasing from 12.4% in 1995 to 13.3% in 2009. The industry's concentration increased from 3.92 to 3.98 over the period and overall jobs grew about 1% in comparison to the region's overall job loss of 6.1%. Average annual wages increased 9.2% over the period, though the industry's average annual wage ($13,685) was less than half the regional average of $29,794.

The Tourism industry offers opportunities for entry-and mid-level workers to learn customer service skills, which are in demand in most careers. Additionally, the Redwood Coast region's natural amenities and relative lack of tourist-serving facilities present opportunities for innovation and entrepreneurship.

Unfortunately, the part-time, seasonal nature of most tourism jobs, few options for year-round employment and limited income potential present concerns for workforce development and stability. Employers must also expend considerable resources managing turnover and recruitment.

Tourism is part of the region's basic economic foundation, bringing in significant dollars from outside the region. Additionally, the industry offers workers flexible opportunities to enter or re-enter the labor market and supports a significant number of skilled positions in management and facilities maintenance.

Examples: Redwood Coast businesses that fall under the category of Tourism

Trees of Mystery

The Carson Mansion
The Ingomar Club

Ferndale
The Victorian Village

North Coast Adventure Centers

Carter House Inns

Mt. Shasta Ski Park

Figure 2-22: Tourism Performance Detail

NAICS Code	Industry Sector (NAICS Title)	Regional Average Employment 2009	Average Annual Wage 2009	Employment Concentration 2009	Compound Annual Growth Rate 1995 - 2009	% of Region Employment 2009
	Total Tourism	**11,022**	**$13,685**	**3.98**	**0.1%**	**13.3%**
7111	Performing Arts Companies	27	$12,838	0.28	-1.5%	0%
7113 7114 7115	Promoters, Agents, Managers, & Independent Artists	39	$23,126	0.19	8.9%	0%
7121	Museums, Historical Sites, & Similar Institutions	90	$15,783	0.90	4.3%	0%
7131 7139	Amusement Parks & Other Recreation Industries	920	$11,544	0.89	-0.2%	1%
7211	Traveler Accommodation	2,353	$15,581	1.82	-0.6%	3%
7212	RV (Recreational Vehicle) Parks & Recreational Camps	240	$15,339	7.56	0.9%	0%
7221	Full-Service Restaurants	3,899	$13,927	1.14	0.2%	5%
7222	Limited-Service Eating Places	3,454	$12,421	1.07	0.3%	4%

Industry Drivers and Opportunities for the Tourism Industry

International economic conditions affect the cost of travel (fuel prices), the ability and willingness of individuals to travel and the distances traveled.

Redwoods are iconic to the region and familiar to travelers nationally and internationally. This represents an asset around which collaboration and marketing strategies, programs and projects can be effectively developed and executed in order to increase tourism in the area.

Additional draws include

- Outdoor recreation (cycling, surfing, back-packing, hiking, ocean and lagoon kayaking, river kayaking and rafting, rock-climbing)
- Nature/the outdoors (birding, whale watching)
- Relaxation (spas, dining, lodging)
- Arts, music and other entertainment
- A rural lifestyle

The high concentration of artists, musicians and art and music festivals in the Redwood Coast region provides valuable entertainment for tourists. Connecting tourists with other industries such as niche manufacturing and agriculture, in order to promote purchasing as well as factory and farm tours, offers significant potential to lengthen their stay.

Strategic Work Plan for the Tourism Industry

Approximately one dozen tourist-serving business owners met with Don Ehnebuske, of the Redwood Region Economic Development Commission, to discuss industry challenges and opportunities. Information from those discussions resulted in the following strategic work plan for the Tourism industry.

Key Issues

A) Improve tourist destination information
B) Increase length of stay of tourists
C) Improve tourist experience
D) Simplify permitting processes
E) Improve transportation options
F) Improve marketing
G) Increase tourism-based training opportunities

Assets

A) Located where the Redwoods meet the Pacific Ocean
B) Exceptional and unique natural spaces
C) Bay, rivers and ocean

Quick Wins

A) Airport displays
B) Resource list
C) Correct GPS mapping for Southern Humboldt County locations
D) Provide tourism industry workshops
E) Install directional signs at exits and byways for tourism related businesses
F) Correct the Visit California site to include all tourism related business

Strategy A

Improve Tourist Destination Information

Project 1A. Create directional signage at exits and byways for tourism related businesses

Project 2A. Create accurate and complete online resources

Project 3A. Correct GPS mapping for Southern Humboldt County locations

Project 4A. Create airport brochure rack systems

Project 5A. Create master list of tourism-based resources

Project 6A. Monitor online information to minimize negative messages

Project 7A. Create central online and physical concierge and booking agent for lodging, restaurants and other activities

Strategy B

Increase Length of Stay of Tourists

Project 1B. Create topical self guided tours, such as birding, agri-tourism, heritage

Project 2B. Train Visitor Center staff to suggest additional activities in area

Project 3B. Create tourism campaigns - "Three Days in Humboldt" "Stay Another Day"

Project 4B. Encourage new destination attractions

Strategy C

Improve Visitor Experience

Project 1C. Improve appearance of vacant buildings, increase graffiti control

Project 2C. Encourage establishment of destination management company

Project 3C. Relocate social service facilities away from tourist locations

Strategy D

Simplify Permitting

Project 1D. Develop streamlined health and building-related permitting process

Strategy E

Improve Transportation Options

Project 1E. Improve air transport options

Project 2E. Improve highways

Strategy F

Improve Marketing

Project 1F. Align marketing under Redwood Coast branding

Project 2F. Establish mega Chamber of Commerce mixers to develop cross marketing options

Project 3F. Increased marketing of Avenue of the Giants

Strategy G

Increase Tourism-Based Training Opportunities

Project 1G. Create additional tourism customer service training programs

Project 1G. Provide social media techniques training

Jobs in the Tourism Industry Cluster

Over seventeen hundred (1,732) jobs are projected to open annually in the Tourism industry through 2018. The bulk of job opportunities are in the lower wage level (61%), 28% are in the mid-wage range and 11% fall into the higher wage range. Entering the higher wage fields of Tourism requires a Bachelor's degree or significant related work experience, whereas most of the mid and low-wage range occupations can be entered with moderate to short term on-the-job training (see table: Occupational Employment Projections).

Figure 2-23: Tourism 2008-2018 Occupational Employment Projections

The following table indicates the distribution of high, mid & low wage jobs projected for Tourism from 2008 to 2018.

Wage Ranges	
Higher Wage	11%
Mid-Range Wage	28%
Lower Wage	61%

SOC Code	Occupation Title	Annual Average Employment		Employment Change (%)	Avg Annual Job Openings (by # of jobs)[1]	2010 Wages, Median Annual[2]	Education and Training Levels[3]
		2008	2018				
11-2021	Marketing Managers	30	40	33.3	1	$105,352	4
11-1011	Chief Executives	280	270	-3.6	8	$105,327	4
11-9199	Managers, All Other	290	300	3.4	8	$96,785	8
27-1011	Art Directors	30	30	0.0	1	$77,947	4
11-1021	General, Operations Mgrs	1,390	1,390	0.0	40	$76,125	4
11-2022	Sales Managers	260	310	19.2	11	$70,804	4
19-1023	Zoologists & Wildlife Biologists	90	90	0.0	3	$70,596	3
33-3031	Fish & Game Wardens	30	30	0.0	1	$68,180	9
11-3031	Financial Managers	330	360	9.1	8	$68,070	4
25-9031	Instructional Coordinators	200	220	10.0	6	$62,863	3
51-1011	Mgrs. Production & Operating Workers	280	280	0.0	4	$59,171	8
11-3061	Purchasing Managers	40	40	0.0	1	$58,581	4
11-2031	Public Relations Managers	30	30	0.0	1	$57,955	4
15-1061	Database Administrators	40	40	0.0	1	$57,707	5
29-1031	Dietitians & Nutritionists	40	40	0.0	1	$56,089	5
47-2111	Electricians	180	190	5.6	5	$55,912	9
49-1011	Line Sups, Mgrs Mechs	260	270	3.8	8	$55,330	8
41-1012	Managers, Non-Retail Sales	180	190	5.6	5	$53,686	8
15-1071	Network, Comp System	130	140	7.7	3	$50,768	5
13-2011	Accountants & Auditors	530	610	15.1	17	$50,289	5
11-3011	Admin Services Managers	190	190	0.0	4	$49,964	4

The following table indicates the distribution of high, mid & low wage jobs projected for Tourism from 2008 to 2018.

Wage Ranges	
Higher Wage	11%
Mid-Range Wage	28%
Lower Wage	61%

SOC Code	Occupation Title	Annual Average Employment		Employment Change (%)	Avg Annual Job Openings (by # of jobs)[1]	2010 Wages, Median Annual[2]	Education and Training Levels[3]
		2008	2018				
53-1031	Transportation Mgrs, Vehicle Operator	120	110	-8.3	2	$49,885	8
13-1079	Human Resources, Labor Specialists	60	70	16.7	3	$49,496	5
13-1072	Compensation, Job Analysis Specialists	50	60	20.0	2	$49,017	5
47-2152	Plumbers, Pipefitters, Steamfitters	310	340	9.7	9	$48,582	9
13-1023	Buyers, not Wholesale	90	100	11.1	3	$47,739	5
25-4021	Librarians	90	90	0.0	2	$47,678	3
19-3021	Market Research	70	80	14.3	4	$47,520	3
27-2012	Producers & Directors	30	30	0.0	1	$46,983	4
47-2031	Carpenters	1,120	1,170	4.5	20	$46,496	9
33-1099	Managers, Protective Service Workers	70	70	0.0	3	$45,871	8
41-3099	Sales Representatives Services	130	140	7.7	5	$45,626	10
				TOTAL # JOBS	191		
11-9151	Social & Community Service Managers	250	270	8.0	8	$44,972	5
13-1199	Business Ops Specialists	770	820	6.5	22	$43,727	5
11-9051	Food Service Managers	400	400	0.0	8	$43,379	8
43-1011	Mgrs, Office Admin Support Workers	1,160	1,240	6.9	34	$42,994	8
41-9099	Sales, Related Workers	110	140	27.3	6	$42,544	10
53-3099	Motor Vehicle Operators, All Other	60	60	0.0	1	$41,852	11
37-1012	Mgr. Landscaping, Groundskeeping Wks	310	340	9.7	6	$41,315	8
47-2141	Painters, Maintenance	430	430	0.0	7	$40,477	10
49-3023	Auto Service Techs	560	630	12.5	18	$38,659	7
53-1021	Sups of Laborers	90	100	11.1	3	$38,400	8
41-1011	Sups/Mgrs Retail Sales Workers	1,710	1,870	9.4	53	$36,962	8

The following table indicates the distribution of high, mid & low wage jobs projected for Tourism from 2008 to 2018.

Wage Ranges	
Higher Wage	11%
Mid-Range Wage	28%
Lower Wage	61%

SOC Code	Occupation Title	Annual Average Employment		Employment Change (%)	Avg Annual Job Openings (by # of jobs)[1]	2010 Wages, Median Annual[2]	Education and Training Levels[3]
		2008	2018				
43-6011	Exec Secretaries, Admin Assistants	1,060	1,130	6.6	22	$36,768	10
43-4161	HR Assistants, Except Payroll	130	110	-15.4	4	$36,131	11
15-1041	Computer Support Specialists	250	260	4.0	8	$36,078	6
27-1024	Graphic Designers	130	140	7.7	5	$36,042	5
27-3043	Writers & Authors	50	50	0.0	1	$35,968	5
33-9099	Protective Service Workers, All Other	320	310	-3.1	22	$35,881	11
37-1011	Managers Housekpng Workers	230	220	-4.3	2	$35,728	8
25-4031	Library Technicians	110	110	0.0	5	$34,855	11
49-9091	Vending Machine Servicers & Repairers	60	60	0.0	2	$34,122	10
43-3051	Payroll & Timekeeping Clerks	280	250	-10.7	7	$34,042	10
39-1021	Mgrs, Personal Service Workers	180	190	5.6	6	$33,997	8
11-9081	Lodging Managers	180	190	5.6	5	$33,454	8
43-3031	Bookkeeping, Auditing Clerks	2,000	2,130	6.5	37	$33,420	10
53-3033	Truck Drivers, Light or Delivery Services	650	740	13.8	20	$31,859	11
35-1011	Chefs & Head Cooks	100	100	0.0	1	$31,099	7
27-3011	Radio & Television Announcers	100	90	-10.0	3	$31,048	9
49-9042	Maintenance, Repair Workers	1,190	1,290	8.4	28	$30,717	9
37-3011	Landscaping Workers	1,680	1,840	9.5	36	$30,279	11
43-3021	Billing, Posting Clerks, Machine Ops	390	410	5.1	8	$29,969	10
43-6014	Secretaries	990	960	-3.0	13	$29,218	10
39-6021	Tour Guides & Escorts	40	40	0.0	2	$27,850	10
53-3031	Driver/Sales Workers	260	260	0.0	6	$27,520	11
51-3011	Bakers	200	200	0.0	6	$27,037	9

The following table indicates the distribution of high, mid & low wage jobs projected for Tourism from 2008 to 2018.

Wage Ranges	
Higher Wage	11%
Mid-Range Wage	28%
Lower Wage	61%

SOC Code	Occupation Title	Annual Average Employment		Employment Change (%)	Avg Annual Job Openings (by # of jobs)[1]	2010 Wages, Median Annual[2]	Education and Training Levels[3]
		2008	2018				
43-9061	Office Clerks, General	2,150	2,240	4.2	38	$26,281	11
43-5071	Shipping, Receiving, & Traffic Clerks	460	440	-4.3	11	$26,246	11
27-3031	Public Relations Specialists	100	120	20.0	4	$26,187	5
39-5012	Hairdressers, Hairstylists	260	310	19.2	9	$26,120	7
27-2042	Musicians & Singers	80	90	12.5	3	$25,999	9
35-2012	Cooks, Institution & Cafeteria	310	300	-3.2	8	$25,706	10
				TOTAL # JOBS	488		
43-4171	Receptionists & Information Clerks	700	740	5.7	23	$24,997	11
37-2011	Janitors, Cleaners, except Maids	1,350	1,300	-3.7	26	$24,921	11
43-3041	Gaming Cage Workers	120	90	-25.0	2	$24,905	11
53-7062	Laborers, Freight, Material Movers	1,010	1,060	5.0	37	$24,550	11
35-1012	Managers-Food Prep Workers	740	770	4.1	10	$24,526	8
31-9011	Massage Therapists	170	180	5.9	3	$24,511	7
27-4021	Photographers	40	40	0.0	1	$22,959	9
35-2014	Cooks, Restaurant	670	690	3.0	19	$22,688	9
39-3019	Gaming Service Workers, All Other	60	60	0.0	3	$22,665	10
35-3041	Food Servers, Non-restaurant	70	70	0.0	1	$22,219	11
43-5081	Stock Clerks & Order Fillers	1,130	1,250	10.6	38	$21,935	11
27-4012	Broadcast Technicians	30	30	0.0	1	$21,879	7
39-9011	Child Care Workers	710	720	1.4	22	$21,868	11
41-2011	Cashiers	3,770	4,130	9.5	205	$20,902	11
41-2031	Retail Salespersons	3,580	4,220	17.9	164	$20,840	11
53-3041	Taxi Drivers & Chauffeurs	200	200	0.0	4	$20,838	11
33-9032	Security Guards	630	650	3.2	15	$20,588	11
43-4081	Hotel, Motel, & Resort Desk Clerks	510	600	17.6	27	$20,542	11

The following table indicates the distribution of high, mid & low wage jobs projected for Tourism from 2008 to 2018.

Wage Ranges	
Higher Wage	11%
Mid-Range Wage	28%
Lower Wage	61%

SOC Code	Occupation Title	Annual Average Employment		Employment Change (%)	Avg Annual Job Openings (by # of jobs)[1]	2010 Wages, Median Annual[2]	Education and Training Levels[3]
		2008	2018				
35-3022	Counter Worker, Coffee Shop	620	660	6.5	50	$20,474	11
39-9032	Recreation Workers	590	590	0.0	11	$20,385	5
51-6011	Laundry & Dry-Cleaning Workers	70	70	0.0	1	$20,059	10
37-2012	Maids & Housekeeping	1,460	1,490	2.1	29	$19,877	11
41-2021	Counter & Rental Clerks	730	790	8.2	26	$19,671	11
39-6011	Baggage Porters & Bellhops	30	30	0.0	1	$19,422	11
35-3011	Bartenders	570	570	0.0	20	$19,297	11
41-9041	Telemarketers	60	50	-16.7	1	$19,258	11
39-3031	Ushers, Lobby Attnd, Ticket Takers	30	30	0.0	2	$19,117	11
39-3091	Amusement & Recreation Workers	240	230	-4.2	12	$19,110	11
35-3021	Combined Food Preparation	2,180	2,430	11.5	71	$19,090	11
35-2021	Food Preparation Workers	1,130	1,150	1.8	42	$19,047	11
35-2011	Cooks, Fast Food	800	810	1.3	22	$18,911	11
35-3031	Waiters & Waitresses	2,050	2,080	1.5	117	$18,895	11
35-9021	Dishwashers	620	650	4.8	28	$18,774	11
35-9011	Dining & Cafeteria Attendants	460	460	0.0	20	$18,209	11
				TOTAL # JOBS	1,054		

March 2009 Benchmark
Table includes the self-employed, unpaid family workers, private household workers, & farm employment. Occupations with employment below 30 in 2008 are excluded. Occupation subtotals may not add to the totals due to rounding & the suppression of data. N/A - Information is not available.

[1] Total Jobs are the sum of new jobs & replacement needs.

[2] Annual Wages are the estimated 50th percentile of the distribution of wages; 50% of workers in an occupation earn wages below, & 50% earn wages above the median wage. The wages are from 2010-1st quarter & do not include self-employed or unpaid family workers.

[3] Occupational training & education classifications were developed by the Bureau of Labor Statistics (BLS).

For more information on the classifications, please see the BLS Training Definitions.
1. First Professional Degree - LLD/MD
2. Doctoral Degree
3. Master's Degree
4. Bachelor's Degree or Higher & Some Work Experience
5. Bachelor's Degree
6. Associate Degree
7. Post-Secondary Vocational Education
8. Work Experience in a Related Occupation
9. Long term On-the-Job Training
10. Moderate Term On-the-Job Training
11. Short Term On-the-Job Training

III. Entrepreneurship Capacity: New Firm Creation

In this section, sector data on self-employment firms is provided and analyzed to indicate the region's entrepreneurship capacity. Businesses consisting solely of the owner/operator can be referred to as non-employers, non-employer establishments, self-employment or self-employer firms. Most of these firms are self-employed individuals operating very small unincorporated businesses that may or may not be the owner's principal source of income. They are important because they indicate the Redwood Coast region's capacity for entrepreneurship and can function as early indicators of industry trends.

Nationally, self-employment firms constitute nearly three-quarters of all businesses but average less than 4% of all sales and receipts. Generally, an "establishment" is a single physical location at which business is conducted or services or industrial operations are performed, and these establishments, or businesses with employees, report payroll data to the Employment Development Department, which is used in BLS data. For self-employment firms, each distinct business income tax return filed by a person for a business is counted as an establishment. Data for self-employment firms is provided at broader levels of industry than data for employers and these firms are excluded from most other business statistics.

Self-employment firms in this report include businesses that:

- Have no paid employees or payroll;
- Have receipts of $1,000 or more ($1 or more for the construction sector); and
- File tax forms for sole proprietorships (Form 1040, Schedule C), partnerships (Form 1065), or corporations (the Form 1120 series).

All NAICS sectors are included, except for:

- Crop and animal production;
- Investment funds, trusts, and other financial vehicles;
- Management of companies and enterprises; and
- Public administration.

The US Internal Revenue Service (IRS) captures self-employment data and reports the information to the Census Bureau, which then displays the data. IRS data is not comparable to the BLS data (delivered through the California Employment Development Department, Labor Market Information Division) and used for the industry cluster analysis in this report. As a result, the two data sets cannot be combined. This report uses BLS data for general industry cluster analysis and IRS data to analyze entrepreneurship capacity.

Some related industry data is available among the above excluded industries from other sources. For example, crop and animal production data is captured by the US Department of Agriculture.

Analysis:

The following table and chart summarize the analysis findings and reflect a gain of 3,529 (16.7%) regional self-employment firms from 2002 to 2009. Regional firms experienced 2.2% annual growth rate (CAGR) in spite of an economic peak in 2006 and subsequent recession through 2009. The Construction sector added the most self-employment firms, increasing from 2,800 in 2002 to 3,850 in 2009, which is a 4.7% CAGR. The next largest gainers were Waste Management & Remediation, with a 6.1% increase, and Services and Administrative & Support, which experienced 3.1% growth. Professional, Scientific, & Technical Services followed with a 1.9% CAGR, which amounted to an additional 409 firms. Among the 16 self-employment sectors, four sectors—Retail, Real Estate, Transportation and Wholesale—did not grow, which aligns with industry contractions during the national recession.

Region/Location Quotient

A location quotient (LQ) of 1 or higher means the sector is more concentrated in the region than the state and is likely exporting products or services outside the region. Not surprisingly, the self-employment firm concentration aligns with concentration in the Target industries.

In terms of regional economic base industries, Forestry, Fishing and Agricultural Support have the highest concentration in comparison to the state with location quotient of 11.04, which is consistent with the concentration in Specialty Food, Flowers and Beverages and Forest Products Target industry clusters.

Manufacturing self-employment firms within the region are over twice (2.1) as concentrated as the state as a whole. This indicates that a high number of goods are manufactured locally and exported to other areas, which brings significant capital to the region.

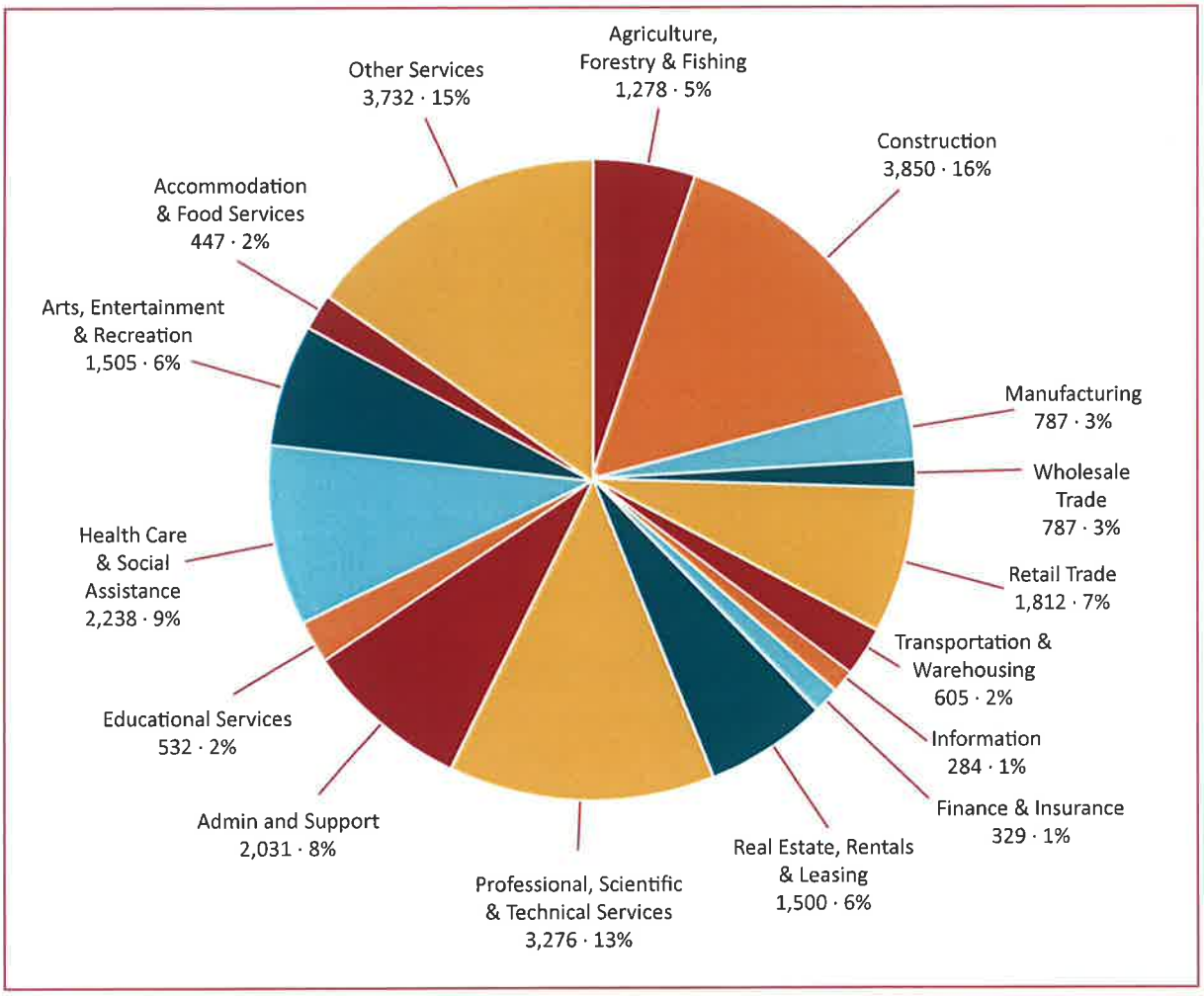
Construction, with a location quotient of 2.0, is also heavily concentrated. While Construction is generally considered a non-export industry, the region's heavy concentration indicates the industry is exporting services to surrounding counties and likely beyond.

Accommodation & Food Services (1.3) combined with Arts, Entertainment and Recreation (1) import income into the region as key tourist-serving industry sectors and are important region-wide.

Figure 3-1: Self-Employment Firms Growth and Performance

NAICS	Description	Number of Firms		Firm Growth	CAGR	2009 LQ	Receipts ($1,000)		Receipt Growth ($1,000)
		2002	2009				2002	2009	
00	**Total for all sectors**	**21,125**	**24,654**	**3,529**	**2.2%**		**$743,851**	**$824,980**	**$81,129**
11	Forestry, fishing & agriculture support	1,187	1,278	91	1.1%	10.9	$46,904	$47,768	$864
23	Construction	2,800	3,850	1,050	4.7%	2.0	$130,072	$165,204	$35,132
31-33	Manufacturing	719	787	68	1.3%	2.1	$23,668	$23,883	$215
42	Wholesale trade	366	348	-18	-0.7%	0.7	$21,685	$19,071	$2,614
44-45	Retail trade	1,927	1,812	-115	-0.9%	0.9	$80,743	$68,456	$12,287
48-49	Transp'n & warehousing	668	605	-63	-1.4%	0.6	$37,687	$32,435	$5,252
51	Information	223	284	61	3.5%	0.6	$6,380	$7,278	$898
52	Finance & insurance	296	329	33	1.5%	0.4	$15,741	$14,672	$1,069
53	Real estate & rentals	1,607	1,500	-107	-1.0%	0.6	$107,598	$94,289	$13,309
54	Professional, scientific, & technical serv	2,867	3,276	409	1.9%	0.7	$83,948	$95,647	$11,699
56	Admin support & waste management	1,341	2,031	690	6.1%	1.0	$22,314	$42,261	$19,947
61	Educational services	398	532	134	4.2%	0.9	$4,528	$6,051	$1,523
62	Health care & social assist	1,950	2,238	288	2.0%	0.9	$53,120	$67,779	$14,659
71	Arts, enter., & recreation	1,222	1,505	283	3.0%	1.0	$18,425	$25,005	$6,580
72	Accom'n & food services	420	447	27	0.9%	1.3	$19,089	$20,844	$1,755
81	Other services	3,017	3,732	715	3.1%	1.0	$67,818	$90,918	$23,100

Figure 3-2: Self-Employment Firms by Industry, 2009



Source: US Census Bureau. NAICS 21, 22: data not available for all counties. NAICS 51, 52: 2002 Trinity and Del Norte Data not available.

The following table highlights self-employment industry sectors that are performing according to similar criteria under the Targets of Opportunity methodology. These include:

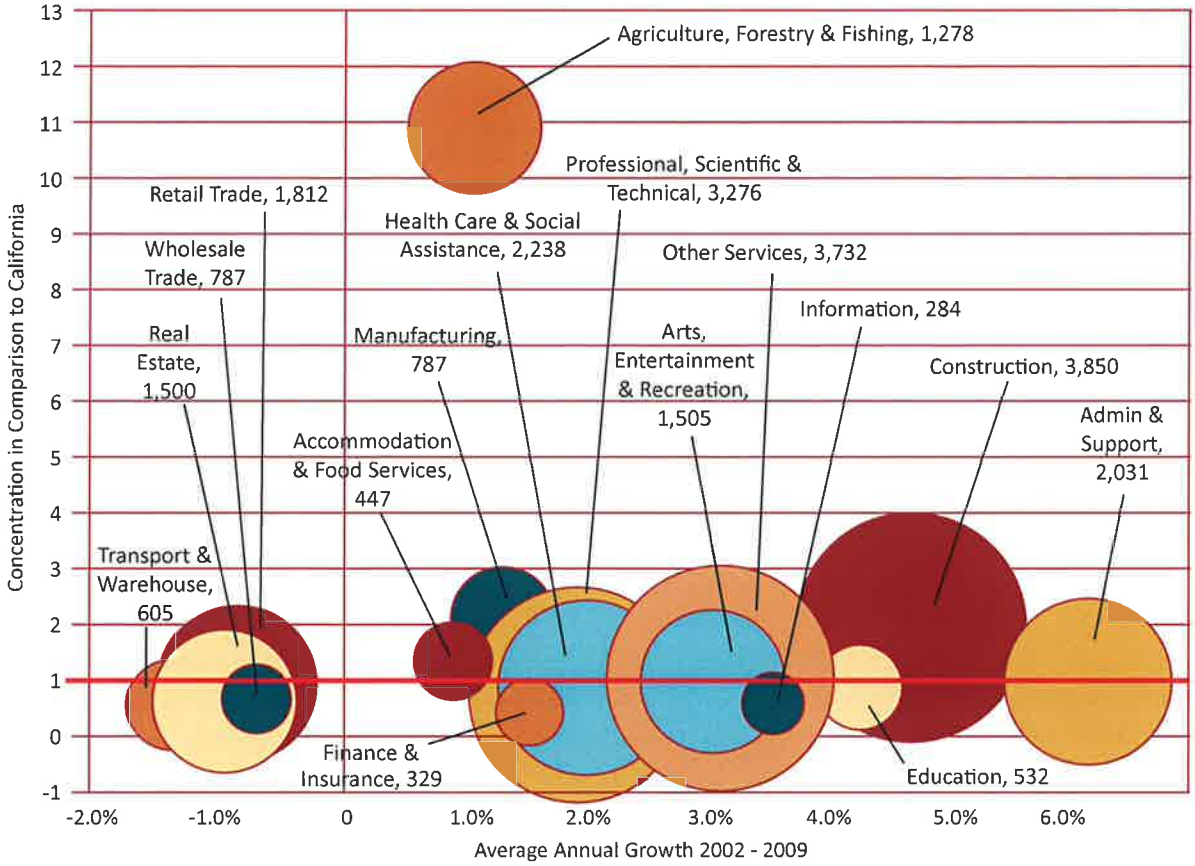
- Establishment growth
- Concentration (LQ at or greater than 1)
- Receipt growth
- Positive relative growth factor (RGF)

As likely exporters of goods outside the region and with increased growth when compared to the state, Forestry, Fishing and Agricultural Support, Construction and Manufacturing are the most promising self-employment industry sectors for entrepreneurial and economic development efforts.

Figure 3-3: Self-Employment Firms Summary

NAICS	Description	Number of Firms		Firm Growth	Firm % Change	Relative Growth Factor	LQ	Receipt Growth ($1,000)	% Receipt Growth
		2002	2009						
11	Forestry, fishing & Ag support	1,187	1,278	91	12.2%	0.81%	10.9	$11,069	28.0%
23	Construction	2,800	3,850	1,050	36.7%	1.10%	2.0	$1,134	2.4%
31-33	Manufacturing	719	787	68	6.7%	1.39%	2.1	$2,326	7.1%
'2	Wholesale trade	366	348	-18	4.9%	-1.56%	0.7	$9,699	-16.4%
44-45	Retail trade	1,927	1,812	-115	-0.7%	-0.94%	0.9	$133	0.3%
48-49	Transportation & warehousing	668	605	-63	2.8%	-5.85%	0.6	$19,186	34.0%
51	Information	223	284	61	19.3%	1.05%	0.6	$4,366	-15.3%
52	Finance & insurance	296	329	33	7.1%	0.98%	0.4	$6,911	-13.0%
53	Real estate & rental & leasing	1,607	1,500	-107	0.8%	-1.93%	0.6	$4,217	-6.3%
54	Prof, scientific & technical serv	2,867	3,276	409	15.6%	0.07%	0.7	$2,407	8.2%
56	Administrative & support & waste management & remediation services	1,341	2,031	690	50.8%	1.87%	1.0	$4,522	27.2%
61	Educational services	398	532	134	26.6%	-2.05%	0.9	$542	4.8%
62	Health care & social assistance	1,950	2,238	288	12.9%	-1.46%	0.9	$2,278	8.4%
71	Arts, Entertainment, & recreation	1,222	1,505	283	25.5%	-0.09%	1.0	$4,475	29.7%
72	Accommodation & food services	420	447	27	10.5%	-1.58%	1.3	$4,903	10.8%
81	Other services	3,017	3,732	715	23.6%	-0.29%	1.0	$2,582	11.5%

Figure 3-4: Self-Employment Firms Summary



Interpreting the chart: The size of the bubble indicates the number of Self-Employment firms. The horizontal axis indicates annual average growth rate over the 2002 – 2009 period. The vertical axis indicates how concentrated regional firms are in comparison to the state as a whole.

Self-Employment Firms 2002 – 2009 and the Target industries with which they are aligned

Mature Industries

Mature Industries have a concentration greater than 1.0 and declining growth. They represent staple industries in the region and are likely exporters, but have no recent establishment growth.

Growth Industries

Growth industries have a concentration greater than 1.0 and firm growth. Along with mature industries, these industries likely export goods and services outside the region, thereby importing capital. As a result, they are considered part of the region's economic base. Target industries are:

- Forestry, Fishing & Ag Support (Forest Products & Specialty Food, Flowers and Beverages)
- Construction (Building and Systems Construction)
- Manufacturing (Niche Manufacturing)
- Accommodation & Food Services (Tourism)

Emerging Industries

Emerging industries have a concentration less than or equal to 1.0 but with firm growth, indicating that the industry's goods and services are in demand. Target industries are:

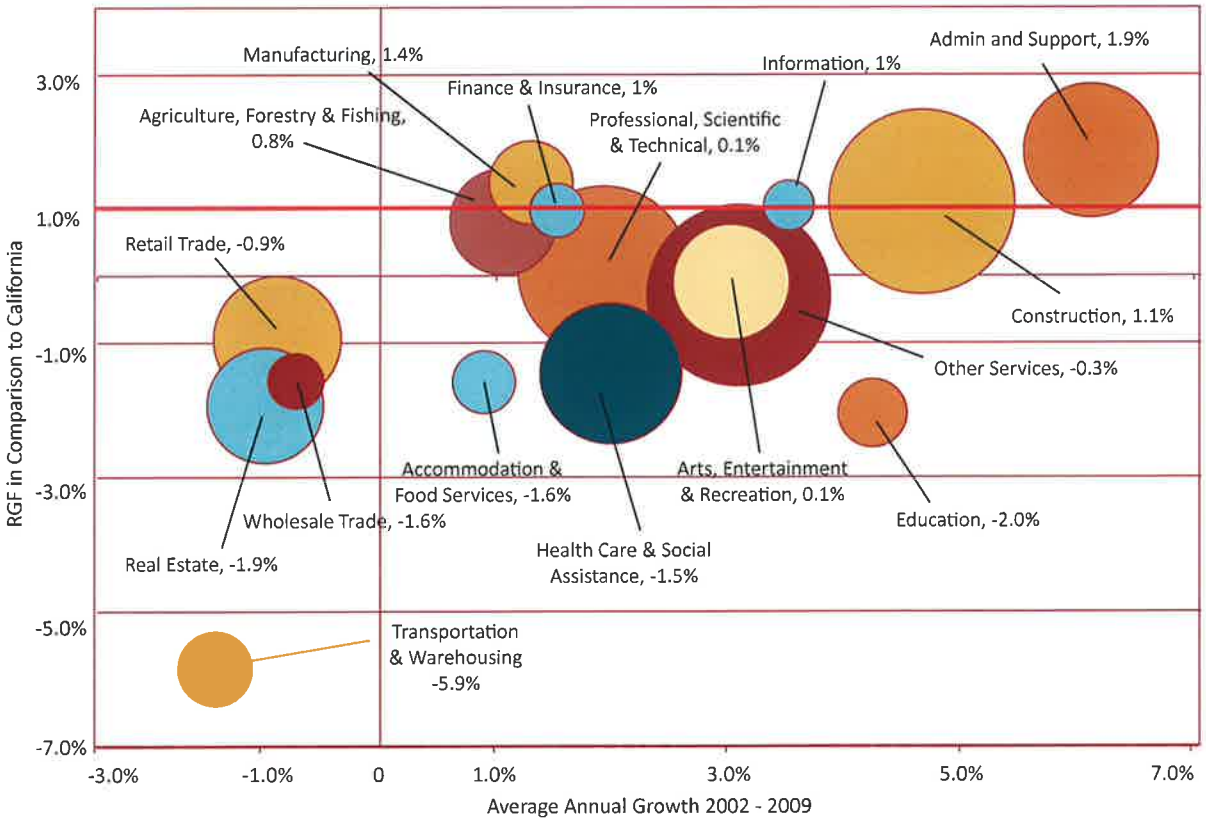
- Information (Management and Innovation Services)
- Finance & Insurance (Investment Support Services)
- Professional, Scientific, & Technical Services (Management and Innovation Services)
- Administrative & Support (Management and Innovation Services)
- Waste Management & Remediation Services (Building and Systems Construction)
- Educational Services (Management and Innovation Services)
- Health Care & Social Assistance (Diversified Health Care)
- Arts, Entertainment & Recreation (Tourism)
- Other Services

Declining Industries

Declining industries have low concentration and decreased establishment growth. Care should be taken to analyze declining industries to determine if economic development efforts may stem the decline or if the decline is based on factors inherent to the region or industry. Target industries are:

- Retail Trade
- Wholesale Trade
- Transportation & Warehousing
- Real Estate Sales, Rental & Leasing

Figure 3-5: Self-Employment Firms by Relative Growth Factor (RGF)



Interpreting the chart: The size of the bubble indicates the number of Self-Employment firms. The horizontal axis indicates annual average growth rate over the 2002 – 2009 period. The vertical axis indicates relative growth factor (RGF). RGF is a measure of the difference in local region Self-Employment sector growth rate in comparison to statewide performance.

Notes

Methodology

The firm data source for this analysis is U.S. Census Nonemployer Statistics Program for 2002 and 2009. The Census description of the data is as follows: Nonemployer Statistics is an annual series of information about businesses without paid employees that are subject to federal income tax.

This analysis applies similar statistical measurement methods to the nonemployer data for the five-county region comprising the Targets of Opportunity Industry Clusters, including quotient (LQ)—a means of identifying the region's economic base by comparing individual industry sectors to the state as a whole and firm and receipt growth or decline. A third indicator relative growth factor (RGF) is used to measure the difference in local region nonemployer sector growth rate in comparison to statewide performance.

NAICS Defined

Sector 11 Agriculture, Forestry, Fishing and Hunting

The Agriculture, Forestry, Fishing and Hunting sector comprises establishments primarily engaged in growing crops, raising animals, harvesting timber, and harvesting fish and other animals from a farm, ranch, or their natural habitats. The establishments in this sector are often described as farms, ranches, dairies, greenhouses, nurseries, orchards, or hatcheries. The sector distinguishes two basic activities: agricultural production and agricultural support activities.

Sector 23 Construction

The construction sector comprises establishments primarily engaged in the construction of buildings or engineering projects (e.g., highways and utility systems). Establishments primarily engaged in the preparation of sites for new construction and establishments primarily engaged in subdividing land for sale as building sites also are included in this sector.

Sector 31-33 Manufacturing

The Manufacturing sector comprises establishments engaged in the mechanical, physical, or chemical transformation of materials, substances, or components into new products. The assembling of component parts of manufactured products is considered manufacturing, except in cases where the activity is appropriately classified in Sector 23, Construction.

42 Wholesale Trade

The Wholesale Trade sector comprises establishments engaged in wholesaling merchandise, generally without transformation, and rendering services incidental to the sale of merchandise.

44-45 Retail Trade

The Retail Trade sector comprises establishments engaged in retailing merchandise, generally without transformation, and rendering services incidental to the sale of merchandise. The retailing process is the final step in the distribution of merchandise; retailers are, therefore, organized to sell merchandise in small quantities to the general public. This sector comprises two main types of retailers: store and non-store retailers.

48-49 Transportation and Warehousing

The Transportation and Warehousing sector includes industries providing transportation of passengers and cargo, warehousing and storage for goods, scenic and sightseeing transportation, and support activities related to modes of transportation.

51 Information

The Information sector comprises establishments engaged in the following processes: (a) producing and distributing information and cultural products, (b) providing the means to transmit or distribute these products as well as data or communications, and (c) processing data.

52 Finance and Insurance

The Finance and Insurance sector comprises establishments primarily engaged in financial transactions (transactions involving the creation, liquidation, or change in ownership of financial assets) and/or in facilitating financial transactions.

53 Real Estate [Sales] and Rental and Leasing

The Real Estate and Rental and Leasing sector comprises establishments primarily engaged in renting, leasing, or otherwise allowing the use of tangible or intangible assets, and establishments providing related services.

54 Professional, Scientific, and Technical Services

The Professional, Scientific, and Technical Services sector comprises establishments that specialize in performing professional, scientific, and technical activities for others. Activities performed include: legal advice and representation; accounting, bookkeeping, and payroll services; architectural, engineering, and specialized design services; computer services; consulting services; research services; advertising services; photographic services; translation and interpretation services; veterinary services; and other professional, scientific, and technical services.

56 Administrative and Support and Waste Management and Remediation Services

The Administrative and Support and Waste Management and Remediation Services sector comprises establishments performing routine support activities for the day-to-day operations of other organizations. Activities performed include: office administration, hiring and placing of personnel, document preparation and similar clerical services, solicitation, collection, security and surveillance services, cleaning, and waste disposal services.

61 Educational Services

The Educational Services sector comprises establishments that provide instruction and training in a wide variety of subjects.

62 Health Care and Social Assistance

The Health Care and Social Assistance sector comprises establishments providing health care and social assistance for individuals.

71 Arts, Entertainment, and Recreation

The Arts, Entertainment, and Recreation sector includes a wide range of establishments that operate facilities or provide services to meet varied cultural, entertainment, and recreational interests of their patrons. This sector comprises: (1) establishments that are involved in producing, promoting, or participating in live performances, events, or exhibits; (2) establishments that preserve and exhibit objects and sites of historical, cultural, or educational interest; and (3) establishments that operate facilities or provide services that enable patrons to participate in recreational activities or pursue amusement, hobby, and leisure time interests.

72 Accommodation and Food Services

The Accommodation and Food Services sector comprises establishments providing customers with lodging and/or preparing meals, snacks, and beverages for immediate consumption.

81 Other Services (except Public Administration)

The Other Services (except Public Administration) sector comprises establishments engaged in providing services not specifically provided for elsewhere in the classification system. Establishments in this sector are primarily engaged in activities such as equipment and machinery repairing, promoting or administering religious activities, grant-making, advocacy, and providing dry-cleaning and laundry services, personal care services, death care services, pet care services, photofinishing services, temporary parking services, and dating services. Private households that engage in employing workers on or about the premises in activities primarily concerned with the operation of the household are included in this sector.

IV. Occupations of Opportunity Summary

This Occupations Summary builds on the Target industry cluster analysis in order to provide an overview of jobs and careers offering the greatest opportunity within the eight Target industries of the Redwood Coast region. The Target industry cluster analysis provides insight into the most promising industries in which to focus economic development efforts. By extension, this summary of occupational trends and projections provides insight into the best opportunities to focus training and educational resources, as well as providing job seekers with educational and career planning resources. The overall goal is to bridge economic and workforce development by assuring that regional employers have access to an adequately trained and educated workforce. Staffing patterns were applied to the eight Redwood Coast Target Industry Clusters. Taken together, the clusters and their related occupations highlight the region's most promising areas for economic and workforce development.

Occupational Trends and Projections

Total (entire economy) 2008-2018 Redwood Coast region occupational projections are provided for 318 occupations in this report. Of these 318 published occupations, 289 (91%) are within Targets of Opportunity industries.

Occupations within the Target industries are expected to generate 6,130 (6.3% increase) net new jobs by 2018, which is higher than the estimated 6,070 (5.7% increase) net new jobs expected for all published occupations in the region.

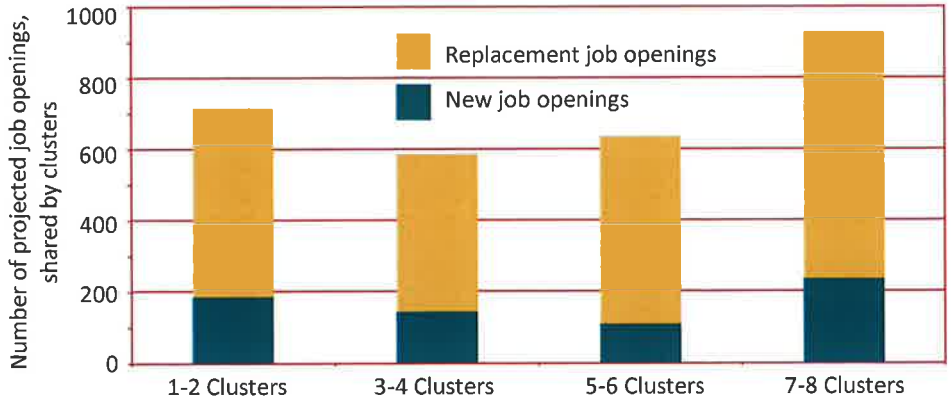
New and Replacement Jobs

Replacement jobs are created when workers retire or permanently leave an occupation and need to be replaced. The sum of new job growth and replacement jobs equals the total job openings. An estimated 3,144 annual average total job openings are projected for the entire region among published occupations through 2018. An estimated 2,901 (92%) of these total projected annual average jobs are within Target occupations.

Targets Occupational Distribution

Industries are generally defined by a single type of good produced or service provided whereas occupations span the entire industry spectrum. Among the job openings projected within the Targets, about 25% of the occupations are in 7 or 8 clusters, 20% are in 5 or 6 clusters, 22% are in 3 or 4 clusters, and 32% are in 1 or 2 clusters.

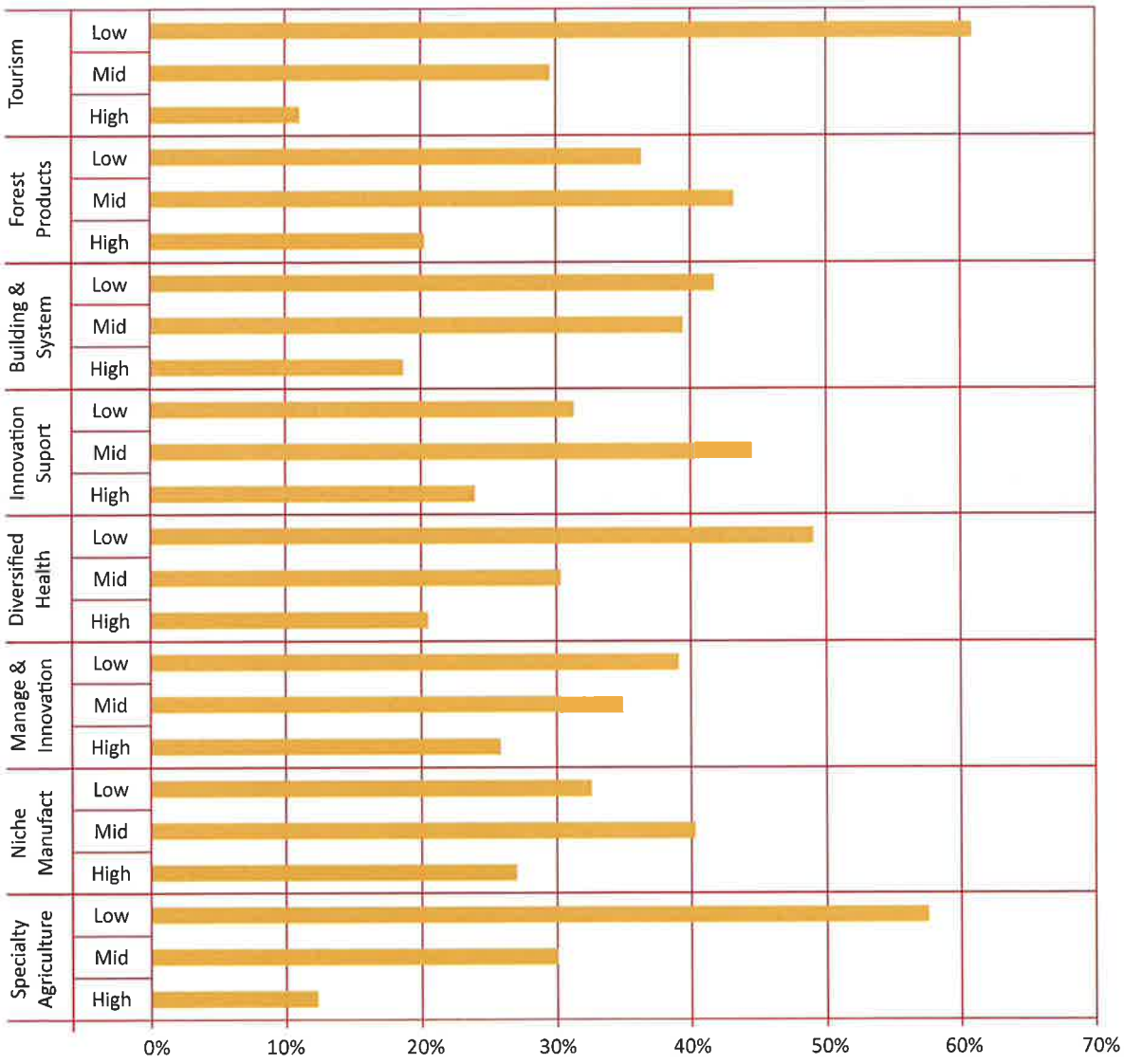
Figure 4-1: Numbers of Projected Job Openings Distributed Among Industry Clusters



Wage Distribution

Among projected Targets occupations, 21% are in the higher wage group, 33% are in mid-wage level and 46% are in the lower wage range. In comparison for the total regional economy, 25% of projected job openings are in the higher wage level, 32% are in the mid, and 43% are in the lower wage level. The lesser number of higher wage jobs within the Targets (21%) compared to the region's (25%) can be attributed to the fact that the bulk of Targets industry jobs are in the private sector, and government and quasi-government agencies tend to skew higher wage level job projections in the region (for example, the US Postal Service). The following table shows the percentage of jobs in low, mid and high-wage occupations in each Target industry.

Figure 4-2: Wage Distributions in each Target Industry Cluster



Education and Training Distribution of Targets Occupations

Among occupations within the Target industries projected through 2018, 51% of the job openings require short term on-the-job training (OJT) of one month or less, 14% require moderate term OJT of one to twelve months, 13% require work experience in a related occupation or long term OJT, 8% require an Associate Degree or post-secondary vocational education and 14% require a Bachelor's Degree or higher. Because Targets occupations comprise 2,901 of the region's 3,144 total job opening projections, there is negligible difference in training and education requirements between Targets and the region as a whole.

Short term on-the-job training provides the skills needed for a worker to attain competency in an occupation that can be acquired during 1 month or less of on-the-job experience and informal training. Training is occupation specific rather than job specific; therefore, skills learned can be transferred to another job in the same occupation. This on-the-job training category also includes employer sponsored training programs. Examples of occupations in the short term category include retail salespersons, maids and house cleaners.

Moderate term on-the-job training provides skills needed for a worker to attain competency in an occupation that can be acquired during 1 to 12 months of combined on-the-job experience and informal training. Training is occupation specific rather than job specific; therefore, skills learned can be transferred to another job in the same occupation. This on-the-job training category also includes employer sponsored training programs. Examples of occupations in the moderate term category include school bus drivers and advertising sales agents.

Long term on-the-job training requires more than 12 months of on-the-job training or, alternatively, combined work experience and formal classroom instruction, that are needed for workers to develop the skills to attain competency. Training is occupation specific rather than job specific; therefore, skills learned can be transferred to another job in the same occupation. This on-the-job training category also includes employer sponsored training programs. Such programs include those offered by fire and police academies and schools for air traffic controllers and flight attendants. In other occupations, nuclear power reactor operators, for example, trainees take formal courses, often provided at the jobsite, to prepare for the required licensing exams. This category excludes apprenticeships. Examples of occupations in the long term on-the-job training category include opticians and automotive service technicians and mechanics.

Figure 4-3: Redwood Coast Region 2008-2018 Fastest Growing Occupations

SOC Code	Occupation Title	Annual Average Employment		Percent Change	2010 First Quarter Wages Median Annual[1]	Education and Training Levels[2]
		2008	2018			
15-1081	Network Systems and Data Communications Analysts	110	160	45.5	$54,172	5
53-7081	Refuse and Recyclable Material Collectors	170	240	41.2	$32,456	11
11-2021	Marketing Managers	30	40	33.3	$105,352	4
15-1031	Computer Software Engineers, Applications	60	80	33.3	$75,180	5
17-2071	Electrical Engineers	30	40	33.3	$87,381	5
29-1071	Physician Assistants	60	80	33.3	$90,707	5
47-4041	Hazardous Materials Removal Workers	30	40	33.3	$38,508	10
49-2097	Electronic Home Entertainment Equipment Installers and Repairers	30	40	33.3	$37,985	7
53-7032	Excavating and Loading Machine and Dragline Operators	30	40	33.3	$35,923	10
31-1011	Home Health Aides	410	530	29.3	$19,674	11
13-2052	Personal Financial Advisors	70	90	28.6	$61,610	5
13-1051	Cost Estimators	110	140	27.3	$55,722	5
41-9099	Sales and Related Workers, All Other	110	140	27.3	$42,544	10
29-2052	Pharmacy Technicians	260	330	26.9	$34,900	10
13-2031	Budget Analysts	40	50	25.0	$58,214	5
17-2081	Environmental Engineers	40	50	25.0	$80,579	5
19-1042	Medical Scientists, Except Epidemiologists	40	50	25.0	$69,041	2
29-1123	Physical Therapists	80	100	25.0	$79,339	3
37-3013	Tree Trimmers and Pruners	180	220	22.2	$41,093	11
43-4051	Customer Service Representatives	740	900	21.6	$29,619	10
13-1041	Compliance Officers, Except Agriculture, Construction, Health and Safety, and Transportation	150	180	20.0	$45,528	9
13-1071	Employment, Recruitment, and Placement Specialists	50	60	20.0	$47,059	5
13-1072	Compensation, Benefits, and Job Analysis Specialists	50	60	20.0	$49,017	5
13-2051	Financial Analysts	50	60	20.0	$88,146	5
27-1023	Floral Designers	50	60	20.0	$27,248	10
27-3031	Public Relations Specialists	100	120	20.0	$26,187	5
29-1062	Family and General Practitioners	50	60	20.0	$144,646	1
29-2055	Surgical Technologists	50	60	20.0	$47,680	7

SOC Code	Occupation Title	Annual Average Employment		Percent Change	2010 First Quarter Wages Median Annual[1]	Education and Training Levels[2]
		2008	2018			
31-2021	Physical Therapist Assistants	50	60	20.0	$50,116	6
31-2022	Physical Therapist Aides	50	60	20.0	$25,057	11
51-9012	Separating, Filtering, Clarifying, Precipitating, and Still Machine Setters, Operators, and Tenders	150	180	20.0	$35,088	10
11-2022	Sales Managers	260	310	19.2	$70,804	4
39-5012	Hairdressers and Cosmetologists	260	310	19.2	$26,120	7
29-2056	Veterinary Technologists and Technicians	110	130	18.2	$31,951	6
43-3011	Bill and Account Collectors	110	130	18.2	$36,030	11
41-2031	Retail Salespersons	3580	4220	17.9	$20,840	11
43-4081	Hotel, Motel, and Resort Desk Clerks	510	600	17.6	$20,542	11
13-1079	Human Resources, Training, and Labor Relations Specialists, All Other	60	70	16.7	$49,496	5
19-2041	Environmental Scientists and Specialists, Including Health	180	210	16.7	$53,232	5
29-1051	Pharmacists	240	280	16.7	$126,695	1
51-3092	Food Batchmakers	60	70	16.7	$24,896	11
31-9092	Medical Assistants	690	800	15.9	$30,230	10
29-1111	Registered Nurses	1650	1910	15.8	$72,083	6
29-2021	Dental Hygienists	130	150	15.4	$91,881	6
51-8013	Power Plant Operators	130	150	15.4	$76,907	9
13-2011	Accountants and Auditors	530	610	15.1	$50,289	5
13-1111	Management Analysts	540	620	14.8	$52,391	4
13-2072	Loan Officers	70	80	14.3	$62,575	5
19-3021	Market Research Analysts	70	80	14.3	$47,520	3
21-1099	Community and Social Service Specialists	140	160	14.3	$30,253	5
27-3091	Interpreters and Translators	70	80	14.3	$25,368	9
41-4011	Sales Representatives, Wholesale, Manufacturing, Technical, Scientific Products	70	80	14.3	$70,423	10
43-5111	Weighers, Measurers, Checkers, and Samplers, Recordkeeping	70	80	14.3	$29,800	11
51-2092	Team Assemblers	210	240	14.3	$23,373	10
51-4121	Welders, Cutters, Solderers, and Brazers	140	160	14.3	$39,625	7
51-7042	Woodworking Machine Setters, Operators, and Tenders, Except Sawing	210	240	14.3	$28,595	10
51-9081	Dental Laboratory Technicians	70	80	14.3	$37,791	9

SOC Code	Occupation Title	Annual Average Employment		Percent Change	2010 First Quarter Wages Median Annual[1]	Education and Training Levels[2]
		2008	2018			
53-3033	Truck Drivers, Light or Delivery Services	650	740	13.8	$31,859	11
21-1015	Rehabilitation Counselors	220	250	13.6	$29,509	3
31-9091	Dental Assistants	380	430	13.2	$32,677	10
11-9021	Construction Managers	160	180	12.5	$89,509	5
13-1073	Training and Development Specialists	80	90	12.5	$49,416	5
17-3031	Surveying and Mapping Technicians	80	90	12.5	$52,432	10
21-1093	Social and Human Service Assistants	560	630	12.5	$26,450	10
27-2042	Musicians and Singers	80	90	12.5	$25,999	9
29-1126	Respiratory Therapists	80	90	12.5	$64,196	6
41-9022	Real Estate Sales Agents	80	90	12.5	$23,689	7
43-3061	Procurement Clerks	80	90	12.5	$36,137	11
43-4131	Loan Interviewers and Clerks	80	90	12.5	$32,892	11
43-5061	Production, Planning, and Expediting Clerks	80	90	12.5	$41,505	11
49-3023	Automotive Service Technicians, Mechanics	560	630	12.5	$38,659	7
35-3021	Combined Food Preparation and Serving Workers, Including Fast Food	2180	2430	11.5	$19,090	11
47-2061	Construction Laborers	1070	1190	11.2	$33,493	10
13-1023	Purchasing Agents, Except Wholesale, Retail, and Farm Products	90	100	11.1	$47,739	5
15-1051	Computer Systems Analysts	90	100	11.1	$68,688	5
19-4091	Environmental Science and Protection Technicians, Including Health	90	100	11.1	$47,588	6
29-2099	Health Technologists and Technicians	90	100	11.1	$35,583	7
43-4111	Interviewers, Except Eligibility and Loan	180	200	11.1	$32,134	11
47-3015	Helpers of Pipelayers, Plumbers, Pipefitters, and Steamfitters	90	100	11.1	$30,086	11
49-3093	Tire Repairers and Changers	180	200	11.1	$22,089	11
53-1021	First-Line Supervisors/Managers of Helpers, Laborers, and Material Movers, Hand	90	100	11.1	$38,400	8
47-1011	First-Line Supervisors/Managers of Construction Trades and Extraction Workers	370	410	10.8	$69,425	8

SOC Code	Occupation Title	Annual Average Employment		Percent Change	2010 First Quarter Wages Median Annual[1]	Education and Training Levels[2]
		2008	2018			
51-8031	Water and Liquid Waste Treatment Plant and System Operators	280	310	10.7	$46,792	9
43-5081	Stock Clerks and Order Fillers	1130	1250	10.6	$21,935	11
53-7061	Cleaners of Vehicles and Equipment	190	210	10.5	$20,204	11
43-6013	Medical Secretaries	680	750	10.3	$29,938	7
21-1022	Medical and Public Health Social Workers	100	110	10.0	$48,389	5
23-2011	Paralegals and Legal Assistants	100	110	10.0	$44,299	6
25-9031	Instructional Coordinators	200	220	10.0	$62,863	3
47-2081	Drywall and Ceiling Tile Installers	100	110	10.0	$47,131	10
49-2022	Telecommunications Equipment Installers and Repairers, Except Line Installers	200	220	10.0	$58,571	9
37-1012	First-Line Supervisors/Managers of Landscaping Workers	310	340	9.7	$41,315	8
47-2152	Plumbers, Pipefitters, and Steamfitters	310	340	9.7	$48,582	9
41-2011	Cashiers	3770	4130	9.5	$20,902	11
37-3011	Landscaping and Groundskeeping Workers	1680	1840	9.5	$30,279	11
53-7051	Industrial Truck and Tractor Operators	420	460	9.5	$38,252	11
51-7041	Sawing Machine Setters, Operators, and Tenders, Wood	320	350	9.4	$31,268	10
41-1011	First-Line Supervisors/Managers of Retail Sales Workers	1710	1870	9.4	$36,962	8
11-3031	Financial Managers	330	360	9.1	$68,070	4
43-4141	New Accounts Clerks	110	120	9.1	$25,839	8
45-1011	First-Line Supervisors/Managers of Farming, Fishing, and Forestry Workers	230	250	8.7	$60,091	8
49-9042	Maintenance and Repair Workers, General	1190	1290	8.4	$30,717	9
21-1014	Mental Health Counselors	240	260	8.3	$53,011	3
23-1011	Lawyers	240	260	8.3	$67,770	1
41-2021	Counter and Rental Clerks	730	790	8.2	$19,671	11
11-9151	Social & Com'nity Service Mgers	250	270	8.0	$44,972	5
41-4012	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	500	540	8.0	$47,546	10
49-3031	Bus and Truck Mechanics and Diesel Engine Specialists	250	270	8.0	$41,915	7

SOC Code	Occupation Title	Annual Average Employment		Percent Change	2010 First Quarter Wages Median Annual[1]	Education and Training Levels[2]
		2008	2018			
15-1071	Network and Computer Systems Administrators	130	140	7.7	$50,768	5
27-1024	Graphic Designers	130	140	7.7	$36,042	5
29-2061	Licensed Practical and Vocational Nurses	390	420	7.7	$49,713	7
41-3099	Sales Representatives, Services, All Other	130	140	7.7	$45,626	10
49-9052	Telecommunications Line Installers, Repairers	130	140	7.7	$57,984	9
31-1012	Nursing Aides, Orderlies, and Attendants	660	710	7.6	$22,420	11
21-1011	Substance Abuse and Behavioral Disorder Counselors	140	150	7.1	$38,116	3
25-2012	Kindergarten Teachers, Except Special Educ	280	300	7.1	$55,917	5
29-2034	Radiologic Technologists and Technicians	140	150	7.1	$61,068	6
49-3042	Mobile Heavy Equipment Mechanics	140	150	7.1	$46,774	7
43-1011	First-Line Supervisors/Managers of Office and Administrative Support Workers	1160	1240	6.9	$42,994	8
11-9111	Medical and Health Services Managers	300	320	6.7	$81,713	4
31-9099	Healthcare Support Workers, All Other	150	160	6.7	$34,304	11
49-9099	Installation, Maintenance, and Repair Workers, All Other	150	160	6.7	$30,900	10
53-3032	Truck Drivers, Heavy and Tractor-Trailer	1360	1450	6.6	$38,070	10
43-6011	Executive Secretaries and Administrative Assistants	1060	1130	6.6	$36,768	10
43-3031	Bookkeeping, Accounting, Auditing Clerks	2000	2130	6.5	$33,420	10
13-1199	Business Operations Specialists, All Other	770	820	6.5	$43,727	5
21-1012	Educational, Vocational, School Counselors	310	330	6.5	$51,640	3
35-3022	Counter Attendants, Cafeteria, Food Concession, and Coffee Shop	620	660	6.5	$20,474	11
29-2071	Medical Records, Health Information Techn	160	170	6.3	$29,059	6
43-3071	Tellers	640	680	6.3	$22,747	11
25-3099	Teachers and Instructors, All Other	650	690	6.2	$50,309	5

SOC Code	Occupation Title	Annual Average Employment		Percent Change	2010 First Quarter Wages Median Annual[1]	Education and Training Levels[2]
		2008	2018			
31-9011	Massage Therapists	170	180	5.9	$24,511	7
31-9011	Massage Therapists	170	180	5.9	$24,511	7
43-4171	Receptionists and Information Clerks	700	740	5.7	$24,997	11
11-9081	Lodging Managers	180	190	5.6	$33,454	8
39-1021	First-Line Supervisors/Managers of Personal Service Workers	180	190	5.6	$33,997	8
47-2111	Electricians	180	190	5.6	$55,912	9
25-2041	Special Education Teachers, Preschool, Kindergarten, and Elementary School	190	200	5.3	$68,342	5
39-9021	Personal and Home Care Aides	3640	3830	5.2	$21,516	11
43-3021	Billing and Posting Clerks and Machine Oper	390	410	5.1	$29,969	10
47-2073	Operating Engineers and Other Construction Equipment Operators	400	420	5.0	$46,760	10
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	1010	1060	5.0	$24,550	11
35-9021	Dishwashers	620	650	4.8	$18,774	11
11-9141	Property, Real Estate, and Community Association Managers	420	440	4.8	$33,236	5
47-2031	Carpenters	1120	1170	4.5	$46,496	9
51-3021	Butchers and Meat Cutters	230	240	4.3	$32,197	9
43-9061	Office Clerks, General	2150	2240	4.2	$26,281	11
35-1012	First-Line Supervisors/Managers of Food Preparation and Serving Workers	740	770	4.1	$24,526	8
15-1041	Computer Support Specialists	250	260	4.0	$36,078	6
17-2051	Civil Engineers	250	260	4.0	$91,616	5
25-2011	Preschool Teachers, Except Special Educ	250	260	4.0	$28,718	7
49-1011	First-Line Supervisors/Managers of Mechanics, Installers, and Repairers	260	270	3.8	$55,330	8
11-9199	Managers, All Other	290	300	3.4	$96,785	8
11-9011	Farm, Ranch, and Other Agri Managers	610	630	3.3	$62,588	4
33-9032	Security Guards	630	650	3.2	$20,588	11
35-2014	Cooks, Restaurant	670	690	3.0	$22,688	9
45-2092	Farmworkers, Laborers, Crop, Nursery, Grnhse	2660	2720	2.3	$19,477	11
37-2012	Maids and Housekeeping Cleaners	1460	1490	2.1	$19,877	11

SOC Code	Occupation Title	Annual Average Employment		Percent Change	2010 First Quarter Wages Median Annual[1]	Education and Training Levels[2]
		2008	2018			
35-2021	Food Preparation Workers	1130	1150	1.8	$19,047	11
11-9012	Farmers and Ranchers	4170	4240	1.7	$79,230	9
35-3031	Waiters and Waitresses	2050	2080	1.5	$18,895	11
39-9011	Child Care Workers	710	720	1.4	$21,868	11
11-2031	Public Relations Managers	30	30	0.0	$57,955	4
11-3011	Administrative Services Managers	190	190	0.0	$49,964	4
11-3021	Computer and Information Systems Managers	60	60	0.0	$76,218	4
11-3041	Compensation and Benefits Managers	30	30	0.0	$70,096	4
11-3061	Purchasing Managers	40	40	0.0	$58,581	4
11-9031	Education Administrators, Preschool and Child Care Center/ Program	170	170	0.0	$38,464	4
11-9041	Engineering Managers	50	50	0.0	$92,494	4
11-9051	Food Service Managers	400	400	0.0	$43,379	8
11-9121	Natural Sciences Managers	40	40	0.0	$84,662	4
11-1021	General and Operations Managers	1390	1390	0.0	$76,125	4
13-1022	Wholesale and Retail Buyers, Except Farm	160	160	0.0	$36,384	5
13-1031	Claims Adjusters, Examiners, Investigators	60	60	0.0	$63,007	9
13-2021	Appraisers and Assessors of Real Estate	40	40	0.0	$45,223	7
15-1021	Computer Programmers	50	50	0.0	$39,384	5
15-1061	Database Administrators	40	40	0.0	$57,707	5
17-1011	Architects, Except Landscape and Naval	40	40	0.0	$44,520	5
17-3011	Architectural and Civil Drafters	80	80	0.0	$50,695	7
17-3022	Civil Engineering Technicians	70	70	0.0	$50,145	6
19-1013	Soil and Plant Scientists	50	50	0.0	$47,043	5
19-1023	Zoologists and Wildlife Biologists	90	90	0.0	$70,596	3
19-1029	Biological Scientists, All Other	70	70	0.0	$59,348	5
19-2042	Geoscientists, expt Hydrologists/ Geographers	60	60	0.0	$73,987	3
19-3031	Clinical, Counseling, School Psychologists	130	130	0.0	$86,213	2
19-3051	Urban and Regional Planners	100	100	0.0	$63,178	3
19-4021	Biological Technicians	70	70	0.0	$31,059	6
19-4031	Chemical Technicians	40	40	0.0	$30,049	6
19-4093	Forest and Conservation Technicians	280	280	0.0	$35,013	6

SOC Code	Occupation Title	Annual Average Employment		Percent Change	2010 First Quarter Wages Median Annual[1]	Education and Training Levels[2]
		2008	2018			
19-4099	Life, Physical, Social Science Technicians	60	60	0.0	$42,363	6
21-1013	Marriage and Family Therapists	40	40	0.0	$155,836	3
21-1021	Child, Family, and School Social Workers	600	600	0.0	$40,188	5
21-1023	Mental Health/Substance Abuse Social Wrkrs	180	180	0.0	$46,784	3
21-1091	Health Educators	110	110	0.0	$40,897	3
25-4021	Librarians	90	90	0.0	$47,678	3
25-4031	Library Technicians	110	110	0.0	$34,855	11
25-9041	Teacher Assistants	2090	2090	0.0	$22,837	11
27-1011	Art Directors	30	30	0.0	$77,947	4
27-1026	Merchandise Displayers, Window Trimmers	50	50	0.0	$28,839	10
27-2012	Producers and Directors	30	30	0.0	$46,983	4
27-3022	Reporters and Correspondents	60	60	0.0	$25,586	4
27-3043	Writers and Authors	50	50	0.0	$35,968	5
27-4012	Broadcast Technicians	30	30	0.0	$21,879	7
27-4021	Photographers	40	40	0.0	$22,959	9
29-1031	Dietitians and Nutritionists	40	40	0.0	$56,089	5
29-1041	Optometrists	40	40	0.0	$77,076	1
29-1127	Speech-Language Pathologists	60	60	0.0	$66,973	3
29-2011	Medical and Clinical Laboratory Technologists	50	50	0.0	$69,917	5
29-2081	Opticians, Dispensing	30	30	0.0	$29,901	9
29-9099	Healthcare Practitioners, Technical Workers	40	40	0.0	$61,765	7
31-9094	Medical Transcriptionists	60	60	0.0	$35,330	7
33-1011	First-Line Supervisors/Managers of Correctional Officers	160	160	0.0	$94,715	8
33-1099	First-Line Supervisors/Managers, Protective Service Workers, All Other	70	70	0.0	$45,871	8
33-3031	Fish and Game Wardens	30	30	0.0	$68,180	9
35-1011	Chefs and Head Cooks	100	100	0.0	$31,099	7
35-3011	Bartenders	570	570	0.0	$19,297	11
35-3041	Food Servers, Nonrestaurant	70	70	0.0	$22,219	11
35-9011	Dining Room and Cafeteria Attendants and Bartender Helpers	460	460	0.0	$18,209	11
39-3019	Gaming Service Workers, All Other	60	60	0.0	$22,665	10
39-3031	Ushers, Lobby Attendants, and Ticket Takers	30	30	0.0	$19,117	11

SOC Code	Occupation Title	Annual Average Employment		Percent Change	2010 First Quarter Wages Median Annual[1]	Education and Training Levels[2]
		2008	2018			
39-6011	Baggage Porters and Bellhops	30	30	0.0	$19,422	11
39-6021	Tour Guides and Escorts	40	40	0.0	$27,850	10
39-9032	Recreation Workers	590	590	0.0	$20,385	5
41-3031	Securities, Commodities, and Financial Services Sales Agents	60	60	0.0	$55,756	5
43-4121	Library Assistants, Clerical	60	60	0.0	$24,119	11
43-5031	Police, Fire, and Ambulance Dispatchers	100	100	0.0	$41,556	10
43-5032	Dispatchers, Except Police, Fire, and Ambulance	100	100	0.0	$24,571	10
43-6012	Legal Secretaries	190	190	0.0	$37,567	7
43-9041	Insurance Claims and Policy Processing Clerks	120	120	0.0	$36,003	10
45-2091	Agricultural Equipment Operators	220	220	0.0	$19,227	10
45-4023	Log Graders and Scalers	70	70	0.0	$36,500	10
47-2051	Cement Masons and Concrete Finishers	140	140	0.0	$46,813	9
47-2071	Paving, Surfacing, and Tamping Equipment Operators	50	50	0.0	$41,644	10
47-2141	Painters, Construction and Maintenance	430	430	0.0	$40,477	10
47-2211	Sheet Metal Workers	70	70	0.0	$39,933	10
47-4011	Construction and Building Inspectors	70	70	0.0	$48,877	8
49-2098	Security and Fire Alarm Systems Installers	40	40	0.0	$38,117	7
49-3041	Farm Equipment Mechanics	40	40	0.0	$36,074	7
49-9021	Heating, Air Conditioning, and Refrigeration Mechanics and Installers	50	50	0.0	$39,032	9
49-9041	Industrial Machinery Mechanics	60	60	0.0	$50,101	9
49-9043	Maintenance Workers, Machinery	70	70	0.0	$46,612	9
49-9091	Coin, Vending, and Amusement Machine Servicers and Repairers	60	60	0.0	$34,122	10
51-1011	First-Line Supervisors/Managers of Production and Operating Workers	280	280	0.0	$59,171	8
51-2099	Assemblers and Fabricators, All Other	110	110	0.0	$27,918	10
51-3011	Bakers	200	200	0.0	$27,037	9
51-4041	Machinists	60	60	0.0	$40,444	9
51-6011	Laundry and Dry-Cleaning Workers	70	70	0.0	$20,059	10

SOC Code	Occupation Title	Annual Average Employment		Percent Change	2010 First Quarter Wages Median Annual[1]	Education and Training Levels[2]
		2008	2018			
51-7011	Cabinetmakers and Bench Carpenters	70	70	0.0	$28,867	9
51-9023	Mixing and Blending Machine Setters, Operators, and Tenders	50	50	0.0	$30,594	10
51-9061	Inspectors, Testers, Sorters, Samplers, Weighers	90	90	0.0	$23,866	10
51-9071	Jewelers, Precious Stone, Metal Workers	40	40	0.0	$19,273	7
51-9121	Coating, Painting, and Spraying Machine Setters, Operators, and Tenders	40	40	0.0	$28,792	10
51-9122	Painters, Transportation Equipment	40	40	0.0	$45,820	10
51-9122	Painters, Transportation Equipment	40	40	0.0	$45,820	10
51-9198	Helpers--Production Workers	130	130	0.0	$22,192	11
53-3031	Driver/Sales Workers	260	260	0.0	$27,520	11
53-3041	Taxi Drivers and Chauffeurs	200	200	0.0	$20,838	11
53-3099	Motor Vehicle Operators, All Other	60	60	0.0	$41,852	11
53-7064	Packers and Packagers, Hand	380	370	-2.6	$19,067	11
43-6014	Secretaries, Except Legal, Medical, Executive	990	960	-3.0	$29,218	10
33-9099	Protective Service Workers, All Other	320	310	-3.1	$35,881	11
11-1011	Chief Executives	280	270	-3.6	$105,327	4
37-2011	Janitors and Cleaners, Except Maids and Housekeeping Cleaners	1350	1300	-3.7	$24,921	11
45-4022	Logging Equipment Operators	250	240	-4.0	$36,616	10
39-3091	Amusement and Recreation Attendants	240	230	-4.2	$19,110	11
37-1011	First-Line Supervisors/Managers of Housekeeping and Janitorial Workers	230	220	-4.3	$35,728	8
43-5071	Shipping, Receiving, and Traffic Clerks	460	440	-4.3	$26,246	11
53-3022	Bus Drivers, School	210	200	-4.8	$32,880	11
47-2181	Roofers	190	180	-5.3	$45,485	10
29-1021	Dentists, General	180	170	-5.6	$108,608	1
53-1031	First-Line Supervisors/Managers of Transportation and Material-Moving Machine and Vehicle Operators	120	110	-8.3	$49,885	8
27-3011	Radio and Television Announcers	100	90	-10.0	$31,048	9

SOC Code	Occupation Title	Annual Average Employment		Percent Change	2010 First Quarter Wages Median Annual[1]	Education and Training Levels[2]
		2008	2018			
29-2041	Emergency Medical Technicians, Paramedics	200	180	-10.0	$24,000	7
51-9111	Packaging and Filling Machine Operators	400	360	-10.0	$19,873	11
43-3051	Payroll and Timekeeping Clerks	280	250	-10.7	$34,042	10
43-9022	Word Processors and Typists	70	60	-14.3	$31,779	10
45-4021	Fallers	280	240	-14.3	$37,782	10
43-4151	Order Clerks	130	110	-15.4	$29,041	11
43-4161	Human Resources Assistants, Except Payroll and Timekeeping	130	110	-15.4	$36,131	11
41-9041	Telemarketers	60	50	-16.7	$19,258	11
43-4071	File Clerks	60	50	-16.7	$19,654	11
43-5041	Meter Readers, Utilities	60	50	-16.7	$52,695	11
11-3071	Transportation, Storage, Distribution Mngrs	50	40	-20.0	$76,623	8
51-4031	Cutting, Punching, Press Machine Setters, Operators, Tenders, Metal and Plastic	50	40	-20.0	$31,897	10
43-9199	Office and Administrative Support Workers	90	70	-22.2	$29,358	10
51-5023	Printing Machine Operators	90	70	-22.2	$34,372	10
43-3041	Gaming Cage Workers	120	90	-25.0	$24,905	11
43-9011	Computer Operators	70	50	-28.6	$35,779	10
43-9021	Data Entry Keyers	70	50	-28.6	$25,741	10

[1] Annual Wages are the estimated 50th percentile of the distribution of wages; 50% of workers in an occupation earn wages below, & 50% earn wages above the median wage. The wages are from 2010-1st quarter & do not include self-employed or unpaid family workers.

[2] Occupational training & education classifications were developed by the Bureau of Labor Statistics (BLS).

Figure 4-4: Occupational Projections by Median Wage, 2008 - 2018

SOC Code	Occupation Title	Total Annual Average Job Openings[1]	2010 First Quarter Wages, Median Annual[2]
21-1013	Marriage and Family Therapists	1	$155,836
29-1062	Family and General Practitioners	1	$144,646
29-1051	Pharmacists	8	$126,695
29-1021	Dentists, General	5	$108,608
11-2021	Marketing Managers	1	$105,352
11-1011	Chief Executives	8	$105,327
11-9199	Managers, All Other	8	$96,785
33-1011	First-Line Supervisors/Managers of Correctional Officers	6	$94,715
11-9041	Engineering Managers	1	$92,494
29-2021	Dental Hygienists	5	$91,881
17-2051	Civil Engineers	5	$91,616
29-1071	Physician Assistants	2	$90,707
11-9021	Construction Managers	3	$89,509
13-2051	Financial Analysts	2	$88,146
17-2071	Electrical Engineers	2	$87,381
19-3031	Clinical, Counseling, and School Psychologists	4	$86,213
11-9121	Natural Sciences Managers	1	$84,662
11-9111	Medical and Health Services Managers	8	$81,713
17-2081	Environmental Engineers	2	$80,579
29-1123	Physical Therapists	3	$79,339
11-9012	Farmers and Ranchers	33	$79,230
27-1011	Art Directors	1	$77,947
29-1041	Optometrists	1	$77,076
51-8013	Power Plant Operators	6	$76,907
11-3071	Transportation, Storage, and Distribution Managers	1	$76,623
11-3021	Computer and Information Systems Managers	1	$76,218
11-1021	General and Operations Managers	40	$76,125
15-1031	Computer Software Engineers, Applications	3	$75,180
19-2042	Geoscientists, Except Hydrologists and Geographers	3	$73,987
29-1111	Registered Nurses	55	$72,083
11-2022	Sales Managers	11	$70,804
19-1023	Zoologists and Wildlife Biologists	3	$70,596
41-4011	Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	3	$70,423
11-3041	Compensation and Benefits Managers	1	$70,096
29-2011	Medical and Clinical Laboratory Technologists	1	$69,917
47-1011	First-Line Supervisors/Managers of Construction Trades and Extraction Workers	11	$69,425
19-1042	Medical Scientists, Except Epidemiologists	2	$69,041

SOC Code	Occupation Title	Total Annual Average Job Openings[1]	2010 First Quarter Wages, Median Annual[2]
15-1051	Computer Systems Analysts	3	$68,688
25-2041	Special Education Teachers, Preschool, Kindergarten, and Elementary School	7	$68,342
33-3031	Fish and Game Wardens	1	$68,180
11-3031	Financial Managers	8	$68,070
23-1011	Lawyers	7	$67,770
29-1127	Speech-Language Pathologists	1	$66,973
29-1126	Respiratory Therapists	3	$64,196
19-3051	Urban and Regional Planners	2	$63,178
13-1031	Claims Adjusters, Examiners, and Investigators	2	$63,007
25-9031	Instructional Coordinators	6	$62,863
11-9011	Farm, Ranch, and Other Agricultural Managers	14	$62,588
13-2072	Loan Officers	2	$62,575
29-9099	Healthcare Practitioners and Technical Workers, All Other	1	$61,765
13-2052	Personal Financial Advisors	3	$61,610
29-2034	Radiologic Technologists and Technicians	3	$61,068
45-1011	First-Line Supervisors/Managers of Farming, Fishing, and Forestry Workers	8	$60,091
19-1029	Biological Scientists, All Other	2	$59,348
51-1011	First-Line Supervisors/Managers of Production/Operating Workers	4	$59,171
11-3061	Purchasing Managers	1	$58,581
49-2022	Telecommunications Equipment Installers and Repairers	6	$58,571
13-2031	Budget Analysts	1	$58,214
49-9052	Telecommunications Line Installers and Repairers	4	$57,984
11-2031	Public Relations Managers	1	$57,955
15-1061	Database Administrators	1	$57,707
29-1031	Dietitians and Nutritionists	1	$56,089
25-2012	Kindergarten Teachers, Except Special Education	8	$55,917
47-2111	Electricians	5	$55,912
41-3031	Securities, Commodities, and Financial Services Sales	2	$55,756
13-1051	Cost Estimators	5	$55,722
49-1011	First-Line Supervisors/Managers of Mechanics, Installers, Repairers	8	$55,330
15-1081	Network Systems and Data Communications Analysts	7	$54,172
19-2041	Environmental Scientists and Specialists, Including Health	8	$53,232
21-1014	Mental Health Counselors	7	$53,011
43-5041	Meter Readers, Utilities	2	$52,695
17-3031	Surveying and Mapping Technicians	2	$52,432
13-1111	Management Analysts	17	$52,391
21-1012	Educational, Vocational, and School Counselors	7	$51,640
15-1071	Network and Computer Systems Administrators	3	$50,768
17-3011	Architectural and Civil Drafters	2	$50,695

SOC Code	Occupation Title	Total Annual Average Job Openings[1]	2010 First Quarter Wages, Median Annual[2]
25-3099	Teachers and Instructors, All Other	14	$50,309
13-2011	Accountants and Auditors	17	$50,289
17-3022	Civil Engineering Technicians	1	$50,145
31-2021	Physical Therapist Assistants	2	$50,116
49-9041	Industrial Machinery Mechanics	2	$50,101
11-3011	Administrative Services Managers	4	$49,964
53-1031	First-Line Supervisors/Managers of Transportation and Material-Moving Machine and Vehicle Operators	2	$49,885
29-2061	Licensed Practical and Licensed Vocational Nurses	15	$49,713
13-1079	Human Resources, Training, and Labor Relations Specialists	3	$49,496
13-1073	Training and Development Specialists	3	$49,416
13-1072	Compensation, Benefits, and Job Analysis Specialists	2	$49,017
47-4011	Construction and Building Inspectors	1	$48,877
47-2152	Plumbers, Pipefitters, and Steamfitters	9	$48,582
21-1022	Medical and Public Health Social Workers	3	$48,389
13-1023	Purchasing Agents, Except Wholesale, Retail, Farm	3	$47,739
29-2055	Surgical Technologists	2	$47,680
25-4021	Librarians	2	$47,678
19-4091	Environmental Science and Protection Technicians	6	$47,588
41-4012	Sales Representatives, Wholesale and Manufacturing	17	$47,546
19-3021	Market Research Analysts	4	$47,520
47-2081	Drywall and Ceiling Tile Installers	2	$47,131
13-1071	Employment, Recruitment, and Placement Specialists	2	$47,059
19-1013	Soil and Plant Scientists	2	$47,043
27-2012	Producers and Directors	1	$46,983
47-2051	Cement Masons and Concrete Finishers	4	$46,813
51-8031	Water and Liquid Waste Treatment Plant and System Op	9	$46,792
21-1023	Mental Health and Substance Abuse Social Workers	5	$46,784
49-3042	Mobile Heavy Equipment Mechanics, Except Engines	4	$46,774
47-2073	Operating Engineers and Other Construction Equipment Operators	9	$46,760
49-9043	Maintenance Workers, Machinery	1	$46,612
47-2031	Carpenters	20	$46,496
33-1099	First-Line Supervisors/Managers, Protective Service Workers	3	$45,871
51-9122	Painters, Transportation Equipment	2	$45,820
51-9122	Painters, Transportation Equipment	2	$45,820
41-3099	Sales Representatives, Services, All Other	5	$45,626
13-1041	Compliance Officers, Except Ag, Construction, Health & Safety, and Transportation	5	$45,528
47-2181	Roofers	3	$45,485
13-2021	Appraisers and Assessors of Real Estate	1	$45,223
11-9151	Social and Community Service Managers	8	$44,972

SOC Code	Occupation Title	Total Annual Average Job Openings[1]	2010 First Quarter Wages, Median Annual[2]
17-1011	Architects, Except Landscape and Naval	1	$44,520
23-2011	Paralegals and Legal Assistants	2	$44,299
13-1199	Business Operations Specialists, All Other	22	$43,727
11-9051	Food Service Managers	8	$43,379
43-1011	First-Line Supervisors/Managers of Office and Administrative	34	$42,994
41-9099	Sales and Related Workers, All Other	6	$42,544
19-4099	Life, Physical, and Social Science Technicians, All Other	3	$42,363
49-3031	Bus and Truck Mechanics and Diesel Engine Specialists	8	$41,915
53-3099	Motor Vehicle Operators, All Other	1	$41,852
47-2071	Paving, Surfacing, and Tamping Equipment Operators	1	$41,644
43-5031	Police, Fire, and Ambulance Dispatchers	3	$41,556
43-5061	Production, Planning, and Expediting Clerks	3	$41,505
37-1012	First-Line Supervisors/Managers of Landscaping Workers	6	$41,315
37-3013	Tree Trimmers and Pruners	6	$41,093
21-1091	Health Educators	2	$40,897
47-2141	Painters, Construction and Maintenance	7	$40,477
51-4041	Machinists	1	$40,444
21-1021	Child, Family, and School Social Workers	15	$40,188
47-2211	Sheet Metal Workers	2	$39,933
51-4121	Welders, Cutters, Solderers, and Brazers	5	$39,625
15-1021	Computer Programmers	1	$39,384
49-9021	Heating, Air Conditioning, and Refrigeration Mechanics	2	$39,032
49-3023	Automotive Service Technicians and Mechanics	18	$38,659
47-4041	Hazardous Materials Removal Workers	2	$38,508
11-9031	Education Administrators, Preschool and Child Care Center/program	5	$38,464
53-1021	First-Line Supervisors/Managers of Hand Laborers	3	$38,400
53-7051	Industrial Truck and Tractor Operators	16	$38,252
49-2098	Security and Fire Alarm Systems Installers	2	$38,117
21-1011	Substance Abuse and Behavioral Disorder Counselors	3	$38,116
53-3032	Truck Drivers, Heavy and Tractor-Trailer	33	$38,070
49-2097	Electronic Home Entertainment Equipment Installers	1	$37,985
51-9081	Dental Laboratory Technicians	1	$37,791
45-4021	Fallers	8	$37,782
43-6012	Legal Secretaries	3	$37,567
41-1011	First-Line Supervisors/Managers of Retail Sales Workers	53	$36,962
43-6011	Executive Secretaries and Administrative Assistants	22	$36,768
45-4022	Logging Equipment Operators	7	$36,616
45-4023	Log Graders and Scalers	2	$36,500
13-1022	Wholesale and Retail Buyers, Except Farm Products	5	$36,384
43-3061	Procurement Clerks	3	$36,137

SOC Code	Occupation Title	Total Annual Average Job Openings[1]	2010 First Quarter Wages, Median Annual[2]
43-4161	Human Resources Assistants, Except Payroll, Timekeeping	4	$36,131
15-1041	Computer Support Specialists	8	$36,078
49-3041	Farm Equipment Mechanics	1	$36,074
27-1024	Graphic Designers	5	$36,042
43-3011	Bill and Account Collectors	4	$36,030
43-9041	Insurance Claims and Policy Processing Clerks	2	$36,003
27-3043	Writers and Authors	1	$35,968
53-7032	Excavating and Loading Machine and Dragline Operators	2	$35,923
33-9099	Protective Service Workers, All Other	22	$35,881
43-9011	Computer Operators	1	$35,779
37-1011	First-Line Supervisors/Managers of Janitorial Workers	2	$35,728
29-2099	Health Technologists and Technicians, All Other	3	$35,583
31-9094	Medical Transcriptionists	1	$35,330
51-9012	Still Machine Setters, Operators, and Tenders	4	$35,088
19-4093	Forest and Conservation Technicians	13	$35,013
29-2052	Pharmacy Technicians	14	$34,900
25-4031	Library Technicians	5	$34,855
51-5023	Printing Machine Operators	2	$34,372
31-9099	Healthcare Support Workers, All Other	3	$34,304
49-9091	Coin, Vending, and Amusement Machine Servicers	2	$34,122
43-3051	Payroll and Timekeeping Clerks	7	$34,042
39-1021	First-Line Supervisors/Mgrs of personal Service Workers	6	$33,997
47-2061	Construction Laborers	19	$33,493
11-9081	Lodging Managers	5	$33,454
43-3031	Bookkeeping, Accounting, and Auditing Clerks	37	$33,420
11-9141	Property, Real Estate, and Com'ty Association Managers	9	$33,236
43-4131	Loan Interviewers and Clerks	3	$32,892
53-3022	Bus Drivers, School	4	$32,880
31-9091	Dental Assistants	12	$32,677
53-7081	Refuse and Recyclable Material Collectors	12	$32,456
51-3021	Butchers and Meat Cutters	9	$32,197
43-4111	Interviewers, Except Eligibility and Loan	7	$32,134
29-2056	Veterinary Technologists and Technicians	5	$31,951
51-4031	Cutting, Punching, and Press Machine Setters, Operators	1	$31,897
53-3033	Truck Drivers, Light or Delivery Services	20	$31,859
43-9022	Word Processors and Typists	1	$31,779
51-7041	Sawing Machine Setters, Operators, and Tenders, Wood	9	$31,268
35-1011	Chefs and Head Cooks	1	$31,099
19-4021	Biological Technicians	3	$31,059
27-3011	Radio and Television Announcers	3	$31,048

SOC Code	Occupation Title	Total Annual Average Job Openings[1]	2010 First Quarter Wages, Median Annual[2]
49-9099	Installation, Maintenance, and Repair Workers, All Other	3	$30,900
49-9042	Maintenance and Repair Workers, General	28	$30,717
51-9023	Mixing and Blending Machine Setters, Operators, Tenders	2	$30,594
37-3011	Landscaping and Groundskeeping Workers	36	$30,279
21-1099	Community and Social Service Specialists, All Other	4	$30,253
31-9092	Medical Assistants	19	$30,230
47-3015	Helpers--Pipelayers, Plumbers, Pipefitters Steamfitters	4	$30,086
19-4031	Chemical Technicians	1	$30,049
43-3021	Billing and Posting Clerks and Machine Operators	8	$29,969
43-6013	Medical Secretaries	16	$29,938
29-2081	Opticians, Dispensing	1	$29,901
43-5111	Weighers, Measurers, Checkers, Samplers, Recordkeeper	3	$29,800
43-4051	Customer Service Representatives	39	$29,619
21-1015	Rehabilitation Counselors	8	$29,509
43-9199	Office and Administrative Support Workers, All Other	2	$29,358
43-6014	Secretaries, Except Legal, Medical, and Executive	13	$29,218
29-2071	Medical Records and Health Information Technicians	5	$29,059
43-4151	Order Clerks	4	$29,041
51-7011	Cabinetmakers and Bench Carpenters	2	$28,867
27-1026	Merchandise Displayers and Window Trimmers	3	$28,839
51-9121	Painting Machine Setters, Operators, Tenders	2	$28,792
25-2011	Preschool Teachers, Except Special Education	7	$28,718
51-7042	Woodworking Machine Setters, Operators, and Tenders	7	$28,595
51-2099	Assemblers and Fabricators, All Other	3	$27,918
39-6021	Tour Guides and Escorts	2	$27,850
53-3031	Driver/Sales Workers	6	$27,520
27-1023	Floral Designers	3	$27,248
51-3011	Bakers	6	$27,037
21-1093	Social and Human Service Assistants	19	$26,450
43-9061	Office Clerks, General	38	$26,281
43-5071	Shipping, Receiving, and Traffic Clerks	11	$26,246
27-3031	Public Relations Specialists	4	$26,187
39-5012	Hairdressers, Hairstylists, and Cosmetologists	9	$26,120
27-2042	Musicians and Singers	3	$25,999
43-4141	New Accounts Clerks	4	$25,839
43-9021	Data Entry Keyers	1	$25,741
27-3022	Reporters and Correspondents	2	$25,586
27-3091	Interpreters and Translators	3	$25,368
31-2022	Physical Therapist Aides	2	$25,057
43-4171	Receptionists and Information Clerks	23	$24,997

SOC Code	Occupation Title	Total Annual Average Job Openings[1]	2010 First Quarter Wages, Median Annual[2]
37-2011	Janitors and Cleaners, Except Maids and Housekeepers	26	$24,921
43-3041	Gaming Cage Workers	2	$24,905
51-3092	Food Batchmakers	3	$24,896
43-5032	Dispatchers, Except Police, Fire, and Ambulance	2	$24,571
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	37	$24,550
35-1012	First-Line Supervisors/Managers of Food Prep Workers	10	$24,526
31-9011	Massage Therapists	3	$24,511
31-9011	Massage Therapists	3	$24,511
43-4121	Library Assistants, Clerical	3	$24,119
29-2041	Emergency Medical Technicians and Paramedics	4	$24,000
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	2	$23,866
41-9022	Real Estate Sales Agents	2	$23,689
51-2092	Team Assemblers	8	$23,373
27-4021	Photographers	1	$22,959
25-9041	Teacher Assistants	45	$22,837
43-3071	Tellers	30	$22,747
35-2014	Cooks, Restaurant	19	$22,688
39-3019	Gaming Service Workers, All Other	3	$22,665
31-1012	Nursing Aides, Orderlies, and Attendants	13	$22,420
35-3041	Food Servers, Nonrestaurant	1	$22,219
51-9198	Helpers--Production Workers	2	$22,192
49-3093	Tire Repairers and Changers	6	$22,089
43-5081	Stock Clerks and Order Fillers	38	$21,935
27-4012	Broadcast Technicians	1	$21,879
39-9011	Child Care Workers	22	$21,868
39-9021	Personal and Home Care Aides	64	$21,516
41-2011	Cashiers	205	$20,902
41-2031	Retail Salespersons	164	$20,840
53-3041	Taxi Drivers and Chauffeurs	4	$20,838
33-9032	Security Guards	15	$20,588
43-4081	Hotel, Motel, and Resort Desk Clerks	27	$20,542
35-3022	Counter Attendants, Cafeteria, Food Concession	50	$20,474
39-9032	Recreation Workers	11	$20,385
53-7061	Cleaners of Vehicles and Equipment	9	$20,204
51-6011	Laundry and Dry-Cleaning Workers	1	$20,059
37-2012	Maids and Housekeeping Cleaners	29	$19,877
51-9111	Packaging and Filling Machine Operators and Tenders	7	$19,873
31-1011	Home Health Aides	15	$19,674
41-2021	Counter and Rental Clerks	26	$19,671
43-4071	File Clerks	2	$19,654

SOC Code	Occupation Title	Total Annual Average Job Openings[1]	2010 First Quarter Wages, Median Annual[2]
45-2092	Farmworkers and Laborers, Crop, Nursery, Greenhouse	78	$19,477
39-6011	Baggage Porters and Bellhops	1	$19,422
35-3011	Bartenders	20	$19,297
51-9071	Jewelers and Precious Stone and Metal Workers	1	$19,273
41-9041	Telemarketers	1	$19,258
45-2091	Agricultural Equipment Operators	6	$19,227
39-3031	Ushers, Lobby Attendants, and Ticket Takers	2	$19,117
39-3091	Amusement and Recreation Attendants	12	$19,110
35-3021	Combined Food Preparation and Serving Workers	71	$19,090
53-7064	Packers and Packagers, Hand	6	$19,067
35-2021	Food Preparation Workers	42	$19,047
35-3031	Waiters and Waitresses	117	$18,895
35-9021	Dishwashers	28	$18,774
35-9011	Dining Room and Cafeteria Attendants and Bar Helpers	20	$18,209
		2901	

[1] Total Jobs are the sum of new jobs & replacement needs.

[2] Annual Wages are the estimated 50th percentile of the distribution of wages; 50% of workers in an occupation earn wages below, & 50% earn wages above the median wage. The wages are from 2010-1st quarter & do not include self-employed or unpaid family workers.

V. Conclusions and Recommendations

The Redwood Coast Targets of Opportunity industries have demonstrated over two overlapping 15-year periods (1990-2004 and 1995-2009) that they have staying power and continue to grow despite several national recessions. They represent a sustained, structural shift in the Redwood Coast economy, emerging as other areas have receded. The original six Target of Opportunity industries still offer the greatest opportunity for economic health and growth in the Redwood Coast region as they continue to produce jobs, raise wages, generate entrepreneurial companies and provide careers for the region's residents.

Together, the six Targets of Opportunity directly account for almost 42% of the private sector employment and their impact is growing as they produce jobs faster and at higher wages than other the region as a whole. They increasingly influence the rest of the economy as the firms and their employees buy other goods and services in the region. Additionally, the Forest Products and Tourism industries turn the region's natural assets into economic engines, bringing in substantial capital and providing jobs and entrepreneurial opportunity for residents. These and other factors combine to offer economic strength and potential for the Redwood Coast region, making it essential to focus on the eight Targets industries as top economic and workforce development priorities.

From Resource-Base to Knowledge-Base

The Redwood Coast region appears to be increasingly a knowledge-based economy. Nationally, the U.S. economy is a strong knowledge-based service economy, but many rural areas have experienced a "brain drain" or out-migration of knowledge and skilled-trade workers into the urban areas. The Redwood Coast region, however, appears to be producing the firms and jobs—particularly in the Management and Innovation Services and Investment Support Services industries, which are growing jobs and wages faster than the region and the other Targets—necessary to retain or draw these knowledge workers back into the area.

Four community assets likely help the Redwood Coast region share the national, rather than rural, trend. These include:

- Humboldt State University, College of the Redwoods and Mendocino College (with regional extension campuses), which produce many knowledge workers and result in a more highly educated community and higher demand for cultural amenities;
- Local industrial history and environmental values that have generated knowledge to trade (e.g. environmental restoration; forest management practices; watershed restoration; water and wastewater systems, etc);
- A mild climate;
- The region's uncommonly beautiful natural environment and small town lifestyle appeal to a segment of talented people who do not want to live in more crowded urban areas.

These community assets provide talented people with incentives to take risks (like starting a business) or evaluate costs differently (like commute time) in order to have a quality rural lifestyle rarely available elsewhere.

These assets, combined with the robust and wide-ranging supports for new business available especially in Humboldt County, likely have led to the entrepreneurship boom that is noted in response to the national recession (2,283 net new firms in Humboldt and 1,066 in Mendocino 2002-2010).

Regional Foundation and Challenge

It is clear that all five counties have a stake in these Targets industries and will benefit from working together to ensure the success of these clusters. In spite of the region's sparse population, rural nature, and isolated communities, each county provides a gateway to the next through limited transportation corridors. Commute patterns of people from home to worksite is a key defining factor for a region. Over 3,300 Redwood Coast workers commute to other counties within the region, creating a shared workforce where 1 in every 27 jobs are filled by intra-regional commuters. These commuters provide cross-industry collaboration and partnerships that support economic interests throughout the region.

Each county has industry strengths, leading firms, and an array of assets to support the Target industries' growth. Below is a sampling of these assets:

- Del Norte is the Easter Lily capital of the world and home to Alexandre EcoDairy Farms, Cholwell, Bentz & Hartwick and Hambro Forest Products. Del Norte also hosts the headquarters of Redwood National and State Parks and functions as the northern gateway to Redwood country for U.S. and international tourists coming to visit the region's giant redwoods.
- Mendocino is the wine leader of the Specialty Food, Flowers and Beverages cluster and is home to wineries like Frey, Fetzer, Brutocao, Scharffenberger and more. VinNow, an innovative company providing wine businesses with software solutions, and Maverick Enterprises, a designer and manufacturer of wine bottle packaging materials, are located in Mendocino County, which also functions as the southern gateway to Redwood country.
- Recreation and tourism businesses abound in Siskiyou County where more than 60% percent of the county's land is managed by government agencies including USDA Forest Service, Bureau of Land Management, the U.S. Fish and Wildlife Service, and the California Department of Fish and Game. Siskiyou is home to the Mount Shasta Ski Park, Sugar Creek Ranch and many museums, parks and historical sites. Siskiyou is the single county in the Targets region with direct access to Interstate 5 and is the northeast gateway to Redwood country.
- Trinity has the Trinity Alps, Trinity Lake, Ruth Lake, and the Trinity River Scenic Byway, providing several venues for outdoor enthusiasts and travelers. The recreation and tourism industries are among Trinity's major economic drivers. Trinity is home to Alpen Cellars and the Coffee Creek Guest Ranch, a first class tourist destination for over 113 years, as well as the Trinity River Lumber Company, a wood products manufacturer and one of the county's largest employers. Trinity is the eastern gateway to Redwood country.

- Humboldt leads the region's counties in Niche Manufacturing as home to Kokatat, Holly Yashi, Baroni, Marimba One, Wildwood Manufacturing, Wallace & Hinz, Fire & Light, Envirotex, Calgon Carbon, and O&M Industries. Humboldt Bay produces a vast majority of oysters consumed by Californians and there is opportunity to further expand shellfish farming to meet the market demand. The county is home to some leading foodie favorites like Cypress Grove Chevre and Lost Coast Brewery. Taken together, the dairy, beverage and seafood product manufacturing industries represent some of the county's largest employers. Humboldt is situated on the coast, in the heart of Redwood country.

The number, depth and variety of assets distributed among the counties is generally tied to each county's population. Humboldt lies geographically in the middle and economically anchors the region with the largest labor force (about 48% of the region's jobs). Humboldt County's job market also draws in workers from surrounding counties (see Fig. 5-1). Humboldt growing new firms and jobs faster than its neighbors.

Figure 5-1: Redwood Coast Regional Commuting Pattern Comparison

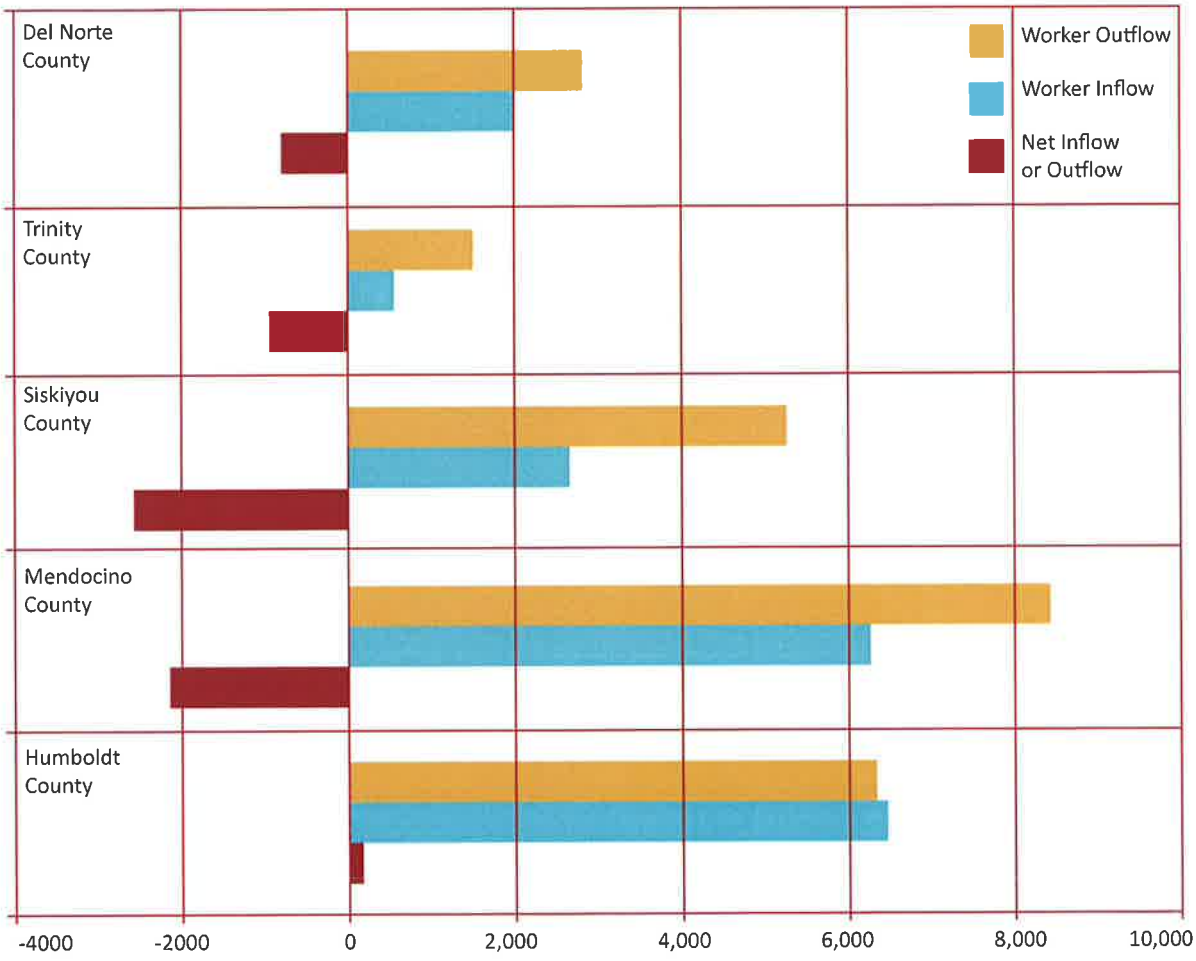


Figure 5-2: Redwood Coast Region Worker Residences by County

		Del Norte	Siskiyou	Mendocino	Trinity	Humboldt	Region Total	Net
COUNTY OF EMPLOYMENT	Del Norte	6,060	147	22	0	318	6,547	487
	Siskiyou	113	8,745	36	28	161	9,083	338
	Mendocino	26	56	19,426	51	368	19,927	501
	Trinity	6	25	2	1,667	126	1,826	159
	Humboldt	798	482	366	170	36,037	37,853	1,816

While commuting patterns are the standard way to define a region, using only that standard would disqualify the Redwood Coast as a "region". The commute pattern reflects a practitioner's challenge in working regionally as each county is distinct and they are all quite distant from each other. In fact, using this definition, Humboldt County could be considered an independent region, and each of the neighboring counties could be part of other regions with the outside neighboring counties. The Redwood Coast region is an adaptation based on the industries, shared workforce—the counties share 3,300 people who work across county lines from their homes—the geography, the cultural affinities of the people, and one common trademark: all are gateways to Redwood Country.

The extreme rural and isolated nature of the counties make collaboration challenging, but also worthwhile. Fortunately, as the Target industries drive and provide the foundation for the economy, they should also drive and provide the foundation for overcoming these obstacles. Working together, economic development practitioners can find ways to use the strengths of one county to stimulate the local economy of neighboring counties and the entire Redwood Coast region.

Many assets, industries and companies span county jurisdictional boundaries, but most companies operate in only one county, as do the economic development players and institutions. As a foundation, it is essential that the economic development practitioners in each county convene local industry leaders to understand the needs and opportunities of each industry from its business owners (The strategic work plans included in this report are a starting place, but they are Humboldt-centric). The opportunity for economic development practitioners to learn from business leaders about their challenges and opportunities and for industry leaders to network is fundamental to facilitating industry cluster growth and should not be underestimated. This process will provide a common foundation for job-creating projects and collaboration locally and regionally.

Recommendations

Based on this assessment of the Redwood Coast, which includes direction from industry leaders in each Target industry, this report offers the following recommendations for economic development:

- Collaborate regionally on economic strategies and projects that support local priorities.

  · Foster cross-county awareness that all communities within the Redwood Coast region function as gateways to each other and that creating favorable business climate for entrepreneurs, maintaining an overall environment that draws creative people and attracts tourism is essential for common regional economic interests.

  · Convene Target industry leaders in each county to understand their challenges and opportunities. Meet with economic development partners in neighboring counties to share findings and identify local and regional projects.

  · Economic development strategists should foster collaboration and cross-pollination among companies within the Target industries, across industries and across county lines to encourage vendor relationships, innovation and entrepreneurship. This includes supporting collaborative marketing/branding programs, employment, purchasing, distribution, and other efforts to help all industry partners prosper. For example, after the 2007 Targets of Industry report was published, businesses within the Specialty Agriculture, Food, & Beverages cluster collaborated in the marketing/branding program, Humboldt Made, as well as coordinating transportation of goods to ensure full truckloads out of and back into the area.
- Prioritize and align workforce and economic development resources to these high-potential Target industries.
- Push for solutions to address inefficiencies in the transportation of goods and people.
- Encourage and support innovation and entrepreneurship in each of the Target industries—focusing on business creation and expansion of existing firms in sectors with a track record of growth in the Redwood Coast region.
- Support business succession planning with the information and support needed to ensure successful businesses in the Target industries survive when founders retire and/or start new businesses.
- Encourage and support more local contracting that utilizes regional expertise. Several industries (Management and Innovation Services, Building and Systems Construction and Investment Support Services) already offer leading experts in trenchless technology, retaining wall design and construction, environmental restoration, water and wastewater system design and more. Further utilizing these experts retains jobs, circulates more dollars locally and helps youth understand that they can pursue excellence in their careers and live in their home communities.

For workforce development:

- Provide in-depth analysis of the demand occupations and the education and training needed to prepare people for careers in the Target industries. This information will allow workforce development professionals to align training resources with industry needs and prepare people for career progression in each Target industry.
- Support Diversified Health Care providers in creating an integrated model of delivery that will improve care, increase access, expand economic vitality, grow employment opportunities and address state and national regulatory demands on the industry.
- Encourage partnerships across Target Industries to market economic potential and career opportunities to specific audiences—such as youth, working residents who could qualify for careers in these target areas, or talent living outside the region who may want to return or move to the region.
- Provide information about the careers in the Target industries—and inspiration from successful people in those careers—to people of all ages so that they can make meaningful choices about their education, training and job choices.
- Prepare entry-level production and related workers while promoting qualified employees into mid-level positions (e.g., Niche Manufacturing; Specialty Agriculture, Food, and Beverages; Building and Systems Construction).
- Support partnerships to mentor and train entry and mid-level workers in areas such as commercial loan under-writing, actuarial services, third-party administrators and appraisers in order to help mitigate the loss of local expertise and higher paying jobs due to retirement.
- Create a comprehensive health care career initiative—recruiting residents for education and training that enables them to move into and through lower, mid, and higher level occupations in Diversified Health Care.
- Build awareness in the region (e.g., among Humboldt State University students and recent graduates and highly skilled but under-employed residents) of growing higher level employment opportunities in Target industry clusters like Management and Innovation Services, Investment Support Services and others.
- Target occupations for recruitment, education, and training that are critical to multiple Targets of Opportunity and expected to grow (e.g., accountants, customer service representatives, computer support specialists, truck drivers).

With a clear track record and strong indication of future growth, the Targets of Opportunity industry clusters are ripe for investment from the region's public, private, and civic leaders. The next step is to build community understanding of the Redwood Coast Targets of Opportunity report findings, so that people understand the new economy currently being experienced and have the information they need to take appropriate actions. Aligning community, economic and workforce development investments with needs and opportunities of the eight Target industries is the best way to ensure the economic health and vitality of the Redwood Coast region.

Appendix I: Guide to Acronyms

ACT	American College Testing
ACV	Arcata Eureka Airport ACV is the regional airport for California's Humboldt County and also serves Del Norte and Mendocino Counties.
AEDC	Arcata Economic Development Corporation
AHEC	Area Health Education Center
Cal eConnect	Nonprofit California public benefit corporation designated by the State of California to lead a collaborative process for ensuring the meaningful use of electronic health information exchange (HIE) in California
Cal X	The California Exchange (Cal-X) is a collaborative online shared utility for data and information exchange
CAM	Complementary and Alternative Medicine
CBO	Community Based Organizations
CCRP	California Center for Rural Policy
CCVB	Humboldt County Convention & Visitors Bureau
CDBG	Community Development Block Grant
CIS	Computer Information Science
CR	College of the Redwoods
DHC	Diversified Health Care
DHCI	Diversified Health Care Industry
DNCOE	Del Norte County Office of Education
DOL	Department of Labor
EDD	Employment Development Department
EHR	Electronic Health Records
EOP	Educational Opportunity Program
H/DN Medical Society	Humboldt/Del Norte Medical Society
HCOE	Humboldt County Office of Education
HDNIPA	Humboldt Del Norte Independent Practice Association
HIE	Health Information Exchange
HITECH	Health Information Technology for Economic and Clinical Health
HITS	Health Information Technology Systems
HRSA	Health Resource Services Administration
HSPA	Health Professional Shortage Area

HSU	Humboldt State University
HVAC	Heating, ventilation, and air conditioning
INRSEP	Indian Natural Resource, Science, And Engineering Program
IRIS	Internet Referral Information System
IT	Information Technology
ITEPP	Indian Teacher and Educational Personnel Program
MUA	Medically Underserved Area
MUP	Medically Underserved Population
NHIN	National Health Information Network
NoRTEC	Northern Rural Training and Employment Consortium
NTMPs	Non-Industrial Timber Management Plans
OSHA	Occupational Safety and Health Administration
PACE	Program of All-inclusive Care for the Elderly
PCR	Primary Care Renewal
RCAA	Redwood Coast Action Agency
RFP	Request for Proposals
RMED	Rural Medical Education Program
ROP	Regional Occupational Program
RREDC	Redwood Region Economic Development Corporation
SBDC	North Coast Small Business Development Center
STAA Truck	A truck with a 48-foot semitrailer, an unlimited overall length, and an unlimited kingpin-to-rear-axle (KPRA) distance. STAA trucks were made legal on the National Network by the 1982 federal Surface Transportation Assistance Act (STAA).
TF	Task Force
WIB	Workforce Investment Board

Appendix II: List of Figures

ATTACHMENT C
HUMBOLDT COUNTY 2014 BANDWIDTH STUDY

NERATECH

Humboldt County Bandwidth 2014

Tina Nerat

6/2/2014

Prepared for:
County of Humboldt Economic Development Division
Funded by Community Development Block Grant

Introduction

The County of Humboldt Prosperity 2012 Action Plan, Strategy E, states:

Build an "infrastructure of connectivity" to move people goods, and information into the global marketplace.

E4: Develop ubiquitous telecommunications connectivity and network redundancy throughout the region.

E5: Develop policies to support and incentivize local buildout of broadband connectivity to the larger fiber optic lines, prioritizing areas with high concentration of Target industry businesses.

Input from Prosperity 2012 and Industry Leader Council meetings was that there are areas where businesses cannot obtain the broadband services they need in order to grow and thrive. Mentioned in particular were medical offices clustered around St Joseph Hospital in the area of Harris and Harrison Streets in Eureka not being able to get the bandwidth they need to deal with electronic medical records and large radiology files.

This study's goal was to:

A. Interview and/or otherwise survey technology support businesses to determine high bandwidth users and blockages of access to high band width broadband Internet.
B. Determine geographic areas or specific kinds of businesses needing greater broadband access.
C. Describe kinds of businesses with high bandwidth needs.
D. Describe how limitations or blockages are occurring, as well as how they are being overcome.
E. Make recommendations as to actions that could be taken to remove limitations or blockages of access.

Background

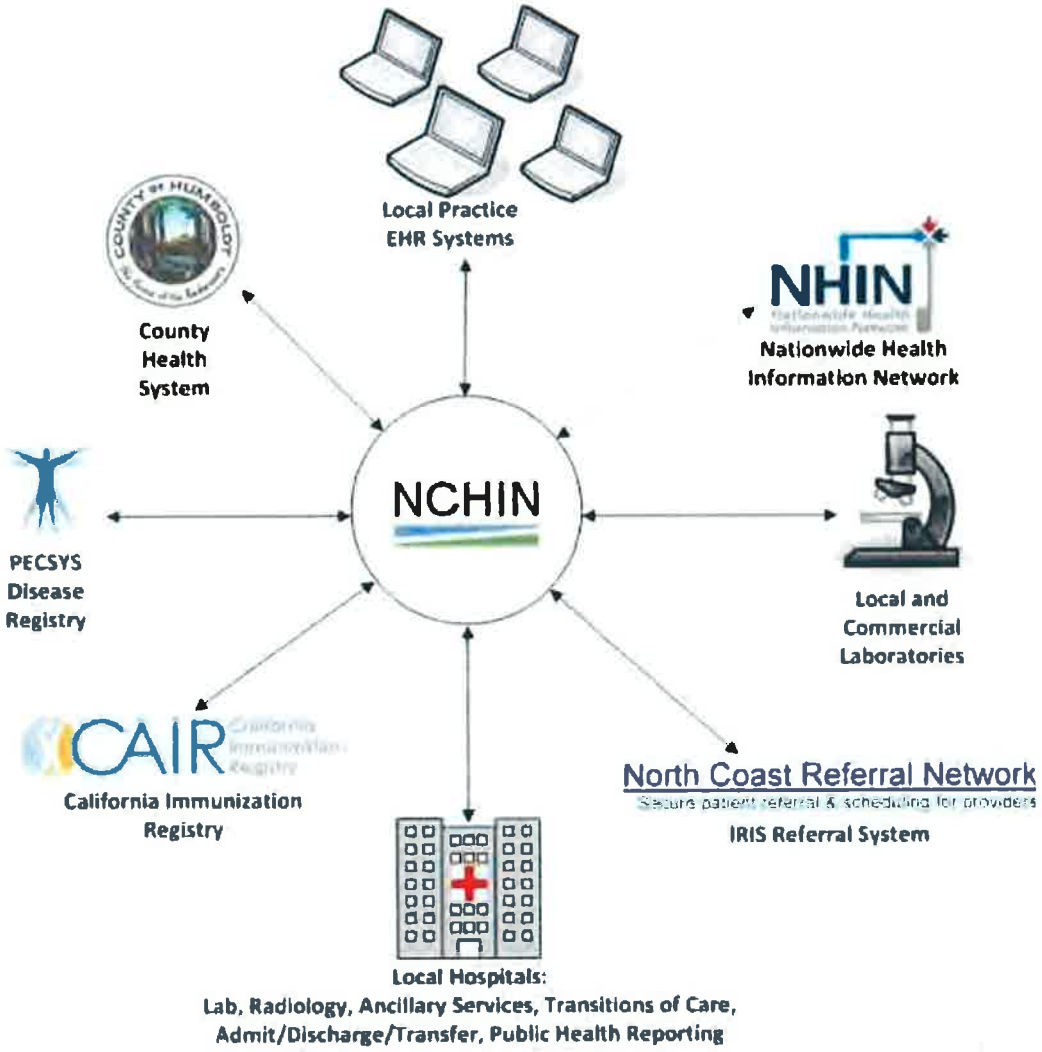
Broadband in Humboldt County has come a long way in the past 15 years, from two small pockets of Pacific Bell (now AT&T) DSL in central areas of Eureka and Arcata in 2000 to several more wireline and fixed wireless broadband providers.

In 2001, there were two overloaded microwaves that carried all voice and data traffic in and out of the region. Now, Humboldt County has multiple alternative "middle mile" routes that carry telecommunications in and out of the region via fiber and microwave. This middle mile route diversity lessens our exposure to being cut off from the rest of the world.

Tech Support Company Interviews

The focus of these interviews was to get input from local tech support companies as well as the Humboldt-Del Norte Foundation for Medical Care and Independent Practice Association (IPA).

Martin Love and Joe Burkett of Humboldt-Del Norte IPA were interviewed. The IPA provides tech support and data interfaces to local medical practices, hospitals, commercial labs, CA immunization registry, claims processing, and more. Because of these services, they have a good sense of what is working and what is not in terms of telecommunications for medical providers. Some of the local medical practices have "hosted" medical records systems, but many have local servers. The IPA's sense is that bandwidth is available and is not the issue unless practices want to pay less and make do with DSL or cable modem service.



Local tech support companies interviewed about their business customers were:

NYLEX
NMS
Infinite
Biztech

Overwhelmingly, the consensus was that access to business broadband is not an issue any more, except in the most remote areas of the county where satellite is the only option. Redwood Capital Bank was also interviewed, and they are able to get the bandwidth they need in Eureka, Fortuna, and (soon) Arcata branches. Streamguys, a high bandwidth usage company in Bayside, has been able to get the bandwidth they need.

Themes from the tech support companies, also echoed by Humboldt-Del Norte IPA, were:

- Companies wanting bandwidth "on the cheap" are getting what they pay for and may not be happy with services.
- Symmetrical dedicated bandwidth (same speeds up/down) customers are happier with their services.
- Serious businesses have higher bandwidth dedicated symmetrical services from AT&T, Suddenlink, or 101Netlink.
- Knowledgeable tech support staff knows what telecommunications services are available, what works best for any given situation, and how to order and implement those services.
- Pricing is competitive on the higher end services, whether from phone companies, cable companies, or fixed wireless companies. California Teleconnect Fund provides discounts for those eligible. Some providers have non-profit rates.
- Customers wanting fiber have generally not had trouble getting it.
- VoIP customers have better quality with higher dedicated bandwidth.
- DSL and cable modem may not work well for offices with more than a few computers.
- Some areas do not have a choice of multiple providers.
- Fixed wireless providers have bandwidth caps, which is a challenge for some businesses. Pandora usage was mentioned by more than one tech support company as contributing to excessive bandwidth usage.
- Businesses need to do more contingency planning for emergencies. Few companies have business continuity plans, hot sites, or alternative bandwidth.
- Cost of bandwidth is a consideration for smaller businesses.
- Many local businesses cannot afford to purchase backup bandwidth in case of disasters.
- Complacency has increased about the need to install backup bandwidth now that there are multiple middle mile routes out of the region.
- More businesses are using backup in the "cloud" or having virtual servers in the "cloud".

Telecommunications Companies

There are a number of telecommunications companies in Humboldt County. Not all of them provide broadband in the County. For purposes of this report, the companies are grouped into phone companies, cable companies, fixed wireless companies, and tribal entities. There are also mobile wireless data services (e.g. AT&T, Verizon Wireless, US Cellular, Sprint), but their data offerings are not business-class services. Note that there are other companies that resell services, but the interviews for this report were of companies that own last mile infrastructure. See Appendix I for a list of communities and their telecom providers. It should be noted that provider services may not be available in all areas of each community listed. Appendix IV contains marketing materials of some of the companies. Pricing is not included in this report.

Phone Companies in Humboldt are:

- AT&T – www.att.com - Central and Northern Humboldt
- Frontier – www.frontier.com - Ferndale, Petrolia, Honeydew (networked/administered out of Central Valley)
- Frontier – www.frontier.com - Orick (networked/administered out of Oregon, formerly Verizon West Coast)
- Verizon California – www.verizon.com - Eastern Humboldt and Southern Humboldt

See Appendix II for a map of phone company territories. Note that Verizon provides no broadband in Humboldt County, and Frontier does not provide broadband in Orick.

AT&T provides broadband in many Humboldt communities in their territory (see Appendix I). They can provide DSL on the low end all the way up to high bandwidth dedicated services from 2mbps to 1gbps over fiber with a redundant backbone, including Ethernet services for businesses with multiple local locations. At the current time, they will provide conduit and electrical work for fiber installations.

Frontier (Ferndale/Mattole) has been providing DSL in Ferndale, Petrolia, and Honeydew for years, one of the first phone companies to provide DSL to remote rural communities. They have been at capacity in Petrolia and Honeydew for the past three years, so bandwidth for customers is very limited. The schools in Mattole Valley are not able to get the bandwidth they need. Frontier has plans to upgrade their microwave to Petrolia and Honeydew this summer if all goes well, but that's only a stopgap solution. They are in discussions with the Redwood Coast Connect consortium about the possibility of fiber backhaul to the Mattole Valley.

Frontier (Orick) does not provide broadband. Orick will be served by the **Karuk Tribe** project, which is in process.

Verizon does not provide broadband in Humboldt County and state that they have no plans to do so.

Cable Companies in Humboldt are:

- Suddenlink – www.suddenlink.com - Central and Northern Humboldt, from Scotia in the south to Big Lagoon in the north and east to Blue Lake, Fieldbrook, and Carlotta
- Wave Broadband – www.wavebroadband.com - Garberville, Redway, and Benbow

Suddenlink offers multiple levels of broadband to its business customers, from 768kbps down/256kbps up cable modem service on the lower end on up to 1gbps dedicated Internet access and 1gbps multi-location Ethernet service on their fiber backbone. They advertise a fully redundant backbone.

Wave Broadband advertises online that they provide 10mbps-1gbps speeds in Garberville and Redway, but there is fine print that says "speed varies by service area". In calling their service center, the rep checked with his supervisor, who confirmed the fastest service they offer in Southern Humboldt is 1.5mbps downstream.

Fixed Wireless Companies in Humboldt are:

- 101Netlink – www.101netlink.com - Southern Humboldt north to McKinleyville, east into Trinity County and south into Mendocino County
- Tsunami Wireless – www.tusnami-wireless.com - Blue Lake and east along Highway 299 into western Trinity County
- Velocity Technology – www.velotech.net - Hoopa

101Netlink is the largest fixed wireless company in Humboldt County, based in Southern Humboldt. They provide business and residential services from 1.5mbps down/500kbps up on the lower end up to dedicated symmetrical services of 100mbps and above. They provide middle mile backhaul services as well and have a redundant network of both fiber and microwave. Some of their services have metered data usage. Their service footprint is very large in Humboldt County, serving the most rural communities as well as larger population centers of Northern Humboldt.

Tsunami Wireless is a relatively new fixed wireless company that serves the Highway 299 corridor, including Blue Lake, Korbel, Willow Creek, Lord Ellis Summit, Redwood Valley, Berry Summit, Horse Mountain, and east into Trinity County. Month-to-month residential and business service options are 3Mbps down/1Mbps up or 6.5Mbps down / 1.6 Mbps up. They serve County, Tribal, Caltrans, and USFS facilities as well as businesses. Their services have metered data usage. Tsunami has plans to serve Fieldbrook and possibly Trinidad in the future.

Velocity Technology is a Weaverville company providing services in Hoopa and is starting to provide services in Willow Creek. Historically, there have been issues with getting enough bandwidth for backhaul from Verizon in Hoopa.

Tribes are playing a role in implementing broadband to the reservations and the remotest communities of Humboldt County. This is where the most "footprint" expansion is happening in the County.

Karuk Tribe is in the process of building broadband infrastructure in Eastern and Northern Humboldt County. In collaboration with its project partner, the **Yurok Tribe**, funding was obtained from the California Advanced Services Fund (CASF) to support implementation of broadband to underserved and unserved communities in Humboldt, Del Norte, and Siskiyou Counties. Two USDA Community Connect Grants are also funding this project. Last mile service will be implemented via fixed wireless.

Their first project focuses on Orleans. As of 5/20/14, this project is waiting on final approval from the funder before construction begins.

The second project, the Klamath River Rural Broadband Initiative, will connect fiber with Sisqtel in Somes Bar and build the fiber down Highway 96 through Orleans and Weitchpec to Route 169 to Highway 101 at Orick and connect in with Suddenlink at Patrick's Point. The **Yurok** and **Karuk** tribes are currently in the environmental and permitting phases. They have completed some of the engineering, and are starting the process of reaching out to all Federal, State, County, Local, and Tribal agencies that must issue permits or approvals before they can reach the construction phase.

See Appendix IV for maps of projects. Discussions are also underway for providing backhaul services to the **Hoopa Tribe** so they can implement services in the Hoopa Valley.

Yurok Tribe provides broadband service to the entire reservation using fixed wireless, though there are small hard-to-reach pockets still unserved. Until the Karuk/Yurok fiber project is completed and provides backhaul, their highest speeds are 2.5mbps down/500kbps up. They do not have data caps on their service. There are about 140 customers.

Hoopa Tribe will be seeking Community Connect grants to provide service to the Hoopa Valley.

Conclusions

This report gives the County of Humboldt an update on the state of broadband in 2014. There's been a lot of progress over the years. Findings are:

- Businesses (and residents) have access to broadband offerings throughout much of the County, though bandwidth/speeds vary by location.
- In the most populated areas of the County, there are multiple providers with high bandwidth offerings, particularly AT&T, Suddenlink, and 101Netlink.
- There are still pockets of more remote areas in the County that are unserved or underserved, though progress is being made to serve these communities by tribal projects, 101Netlink, Frontier, and Tsunami Wireless.

Recommendations

Efforts recommended going forward are:

Tribal projects: Continue to support the Karuk, Yurok, and Hoopa projects as they implement over the next few years. Make sure the unserved pockets of communities get service in this project and do outreach to residents when service is available.

Frontier needs our support and encouragement to improve service to Ferndale and the Mattole Valley.

Support any future **Highway 299** fiber project. This adds another alternate middle mile route out of the County and brings the possibility of higher bandwidth services to Eastern Humboldt communities.

Lack of **business disaster planning/business continuity planning** was a common theme mentioned by tech support providers. Educate and encourage businesses to implement good data backup procedures, to consider hot sites, and to consider backup bandwidth. We focus a lot on personal safety in times of disaster in this County, but not so much on keeping businesses going.

Appendix I

Humboldt County Broadband Providers

4/28/2014

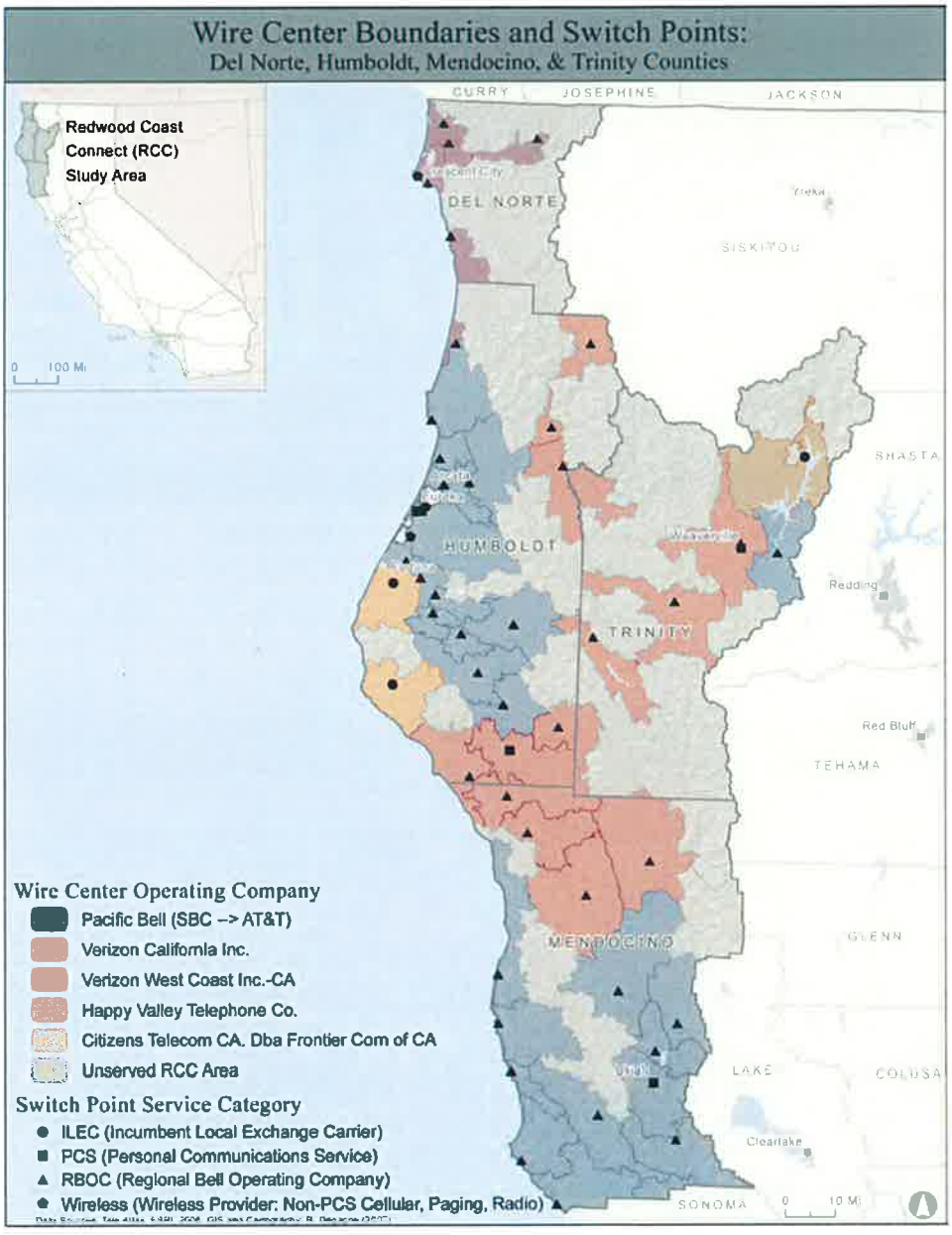
Alderpoint	101Netlink
Alton	101Netlink
Arcata	101Netlink, AT&T, Suddenlink
Bayside	101Netlink, Suddenlink
Benbow	101Netlink, Wave
Berry Summit	Tsunami Wireless
Blocksburg	101Netlink
Blue Lake	Suddenlink, Tsunami Wireless
Briceland	101Netlink
Bridgeville	101Netlink
Carlotta	101Netlink, Suddenlink
Confusion Hill	101Netlink
Crannell	unserved
Cutten	101Netlink, AT&T, Suddenlink
Dinsmore	101Netlink
Eel Rock	unserved (2014 101Netlink plans)
Elk River	101Netlink, Suddenlink
Ettersburg	101Netlink
Eureka	101Netlink, AT&T, Suddenlink
Fernbridge	101Netlink, Suddenlink
Ferndale	101Netlink, Frontier, Suddenlink
Fickle Hill	101Netlink
Fieldbrook	Suddenlink
Fields Landing	101Netlink, Suddenlink
Fort Seward	unserved
Fruitland Ridge	101Netlink
Fortuna	101Netlink, AT&T, Suddenlink
Garberville	101Netlink, Wave
Golden Gate/Bridgeville	101Netlink
Greenwood Heights	101Netlink
Harris	101Netlink
Holmes	101Netlink
Honeydew	Frontier
Hoopa	Velocity Technology (also tribal project being planned 2014)
Horse Mountain	Tsunami Wireless
Humboldt Hill	101Netlink, Suddenlink
Ka Pel	Yurok Tribe
Hydesville	101Netlink, Suddenlink

Johnson	Yurok Tribe
King Salmon	101Netlink, Suddenlink
Kneeland	101Netlink, AT&T
Korbel	Tsunami Wireless
Larabee Valley	101Netlink
Loleta	101Netlink, AT&T, Suddenlink
Lord Ellis Summit	Tsunami Wireless
Manila	101Netlink, Suddenlink
McKinleyville	101Netlink, AT&T, Suddenlink
Miranda	AT&T, 101Netlink
Myers Flat	101Netlink
Myrtletown	101Netlink, AT&T, Suddenlink
New Village (between Orleans & Weitchpec	unserved (Karuk project in process)
Orick	unserved (Karuk project in process)
Orleans	unserved (Karuk project in process)
Pecwan	Yurok Tribe
Pepperwood	unserved
Petrolia	Frontier
Phillipsville	101Netlink
Redcrest	101Netlink
Redway	101Netlink, Wave
Redwood Valley	Tsunami Wireless
Reed Mountain	101Netlink
Richardson Grove	unserved
Rio Dell	101Netlink, AT&T, Suddenlink
Rohnerville	101Netlink, Suddenlink
Salmon Creek	101Netlink
Samoa	101Netlink, Suddenlink
Shelter Cove	101Netlink
Shively	unserved
Scotia	101Netlink, AT&T, Suddenlink
Stafford	101Netlink
Swain's Flat	101Netlink
Trinidad	Suddenlink
Tully Creek	Yurok Tribe
Weott	AT&T
Weitchpec	Yurok Tribe
Whitethorn	101Netlink
Willow Creek	Tsunami Wireless

Appendix II

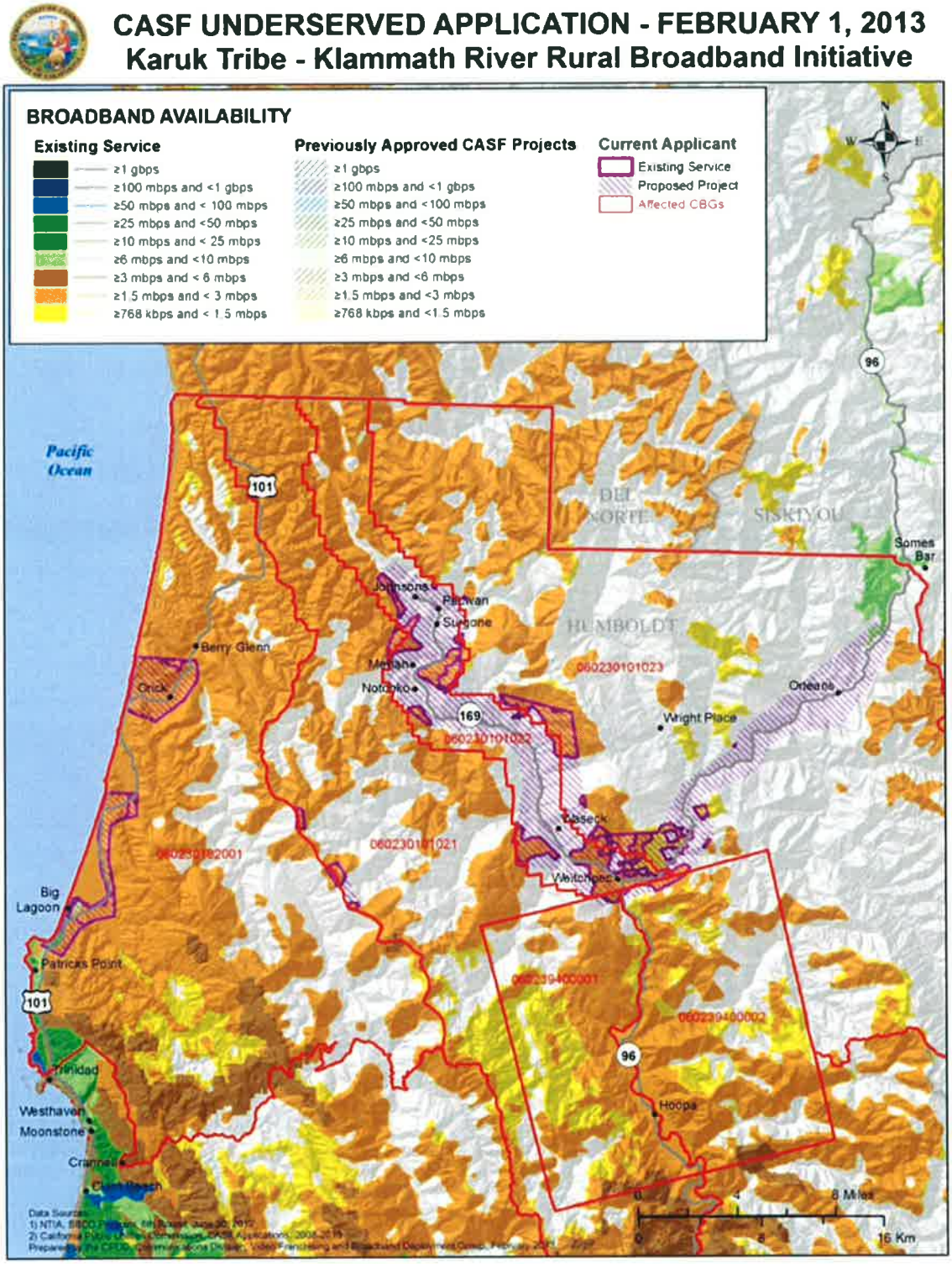
Note that there are four phone companies in Humboldt:

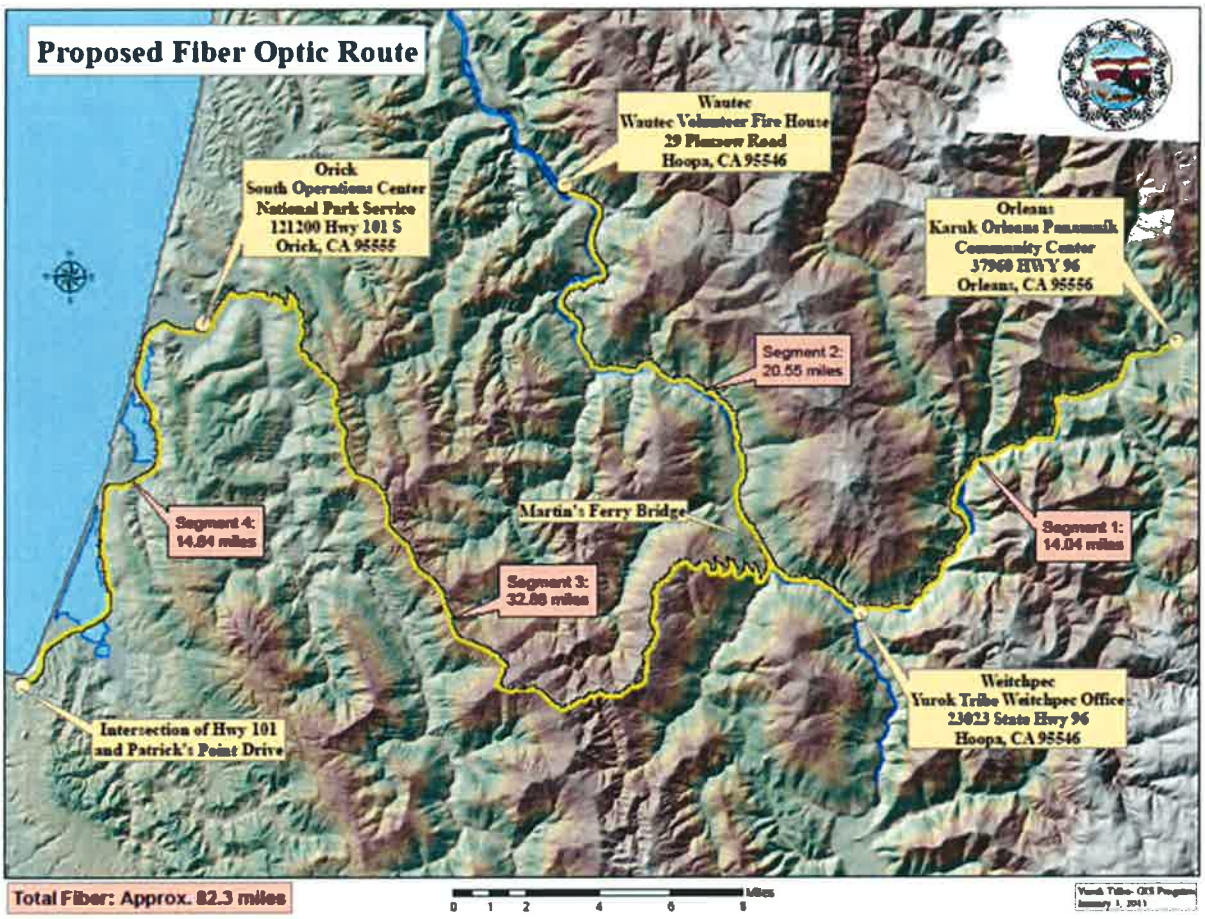
1. AT&T – Central and Northern Humboldt
2. Frontier – Ferndale, Petrolia, Honeydew (administered out of Central Valley)
3. Frontier – Orick (administered out of Oregon, formerly Verizon West Coast)
4. Verizon California – Eastern Humboldt and Southern Humboldt



Appendix III

Karuk Tribe project maps




Proposed Fiber Optic Route
Wautec
Wautec Volunteer Fire House
29 Plummow Road
Hoopa, CA 95546
Orick
South Operations Center
National Park Service
121200 Hwy 101 S
Orick, CA 95555
Orleans
Karuk Orleans Panamnik
Community Center
37960 HWY 96
Orleans, CA 95556
Segment 2:
20.55 miles
Segment 4:
14.84 miles
Martin's Ferry Bridge
Segment 1:
14.04 miles
Segment 3:
32.88 miles
Weitchpec
Yurok Tribe Weitchpec Office
23023 State Hwy 96
Hoopa, CA 95546
Intersection of Hwy 101
and Patrick's Point Drive
Total Fiber: Approx. 82.3 miles
0 1 2 4 6 8
Miles

Appendix IV

High bandwidth marketing flyers from AT&T and Suddenlink are included on the following pages.

Product Brief

Ethernet Services from AT&T

Leverage What You Have Today to Build Tomorrow's Network

What would it mean if you had the ability to design a network that will grow with you and had the true flexibility to run large, diverse applications across town, across the state or even globally? That capability can be leveraged right from your Ethernet Local Area Network (LAN) to seamlessly connect your business together as if there was no distance between you and another office whether they are 5 or 500 or even 5,000 miles away.

Meeting Your Networking Needs

You require faster data speeds but also need to access the Internet and have other locations with different application requirements. The versatility of Ethernet can solve that by providing the high speed, on-time performance you demand while acting as the on-ramp to both the Internet and your IP VPN network. Ethernet can transport your information so you can focus on your core business.

Build on your existing architecture, use Ethernet as a back-up network or simply use it for a new, more reliable way to communicate. You may have highly sensitive data and need the full control that Ethernet provides. Security, continuity and efficiency are realized as your IT staff will set the traffic routes, insert data encryption and police content without expensive outsourcing to do this.

Technology is changing rapidly and with that comes higher demands on your network while pushing bandwidth requirements to its limits. Ethernet solutions from AT&T can scale as your business grows and can expand geographically to accommodate that growth. You need a service that has a variety of bandwidth and configuration options that include switched, dedicated or point-to-point. A solution that can be changed with ease to meet your business applications needs.

An Ethernet Arrangement For You

- Switched Ethernet for many sites. Your business may have two or more locations and may need a Point to Point, Hub and Spoke or fully meshed network design. With switched Ethernet, you can grow from one to many sites and you choose which sites will communicate with each other. Switched Ethernet is a shared network arrangement which provides a low cost easy to build solution.
- Dedicated Ethernet for concentrated heavy bandwidth use. If your business has heavy bandwidth between two locations, like Data Center to Data Center File transfers or two large sites (Sales Distribution Center to Accounting), you may require a high bandwidth, reliable, highly secure and cost effective Point to Point link.
- Hybrid – networks that work together. Your business may have hundreds or even thousands of locations, so it may not be practical to have a single network like Ethernet. That's where a Hybrid network solution is the answer. Both Ethernet and IP VPN services offer you a range of choices and benefits that fill the need to run multiple applications at remote locations, branch offices and heavy bandwidth sites.
- Ethernet access is the fastest growing access technology available today. While Ethernet is a technology and a network in itself, it's also the gateway to your IP VPN or the Internet.
- Copper solution to minimize construction Costs. This is great news if your business is in an area that is not fiber rich such as a rural area. For bandwidth speeds of 10 Mbps or below, Ethernet may be provided over the same copper pairs used for your telephone service. This saves on expensive costs to install fiber.

Benefits

- Ethernet is universal technology with a familiar look and feel that makes it easier to connect and run
- You're in control as you route, manage and prioritize applications
- No special provisioning is needed for most applications you run
- Well suited for bandwidth intensive applications like Voice over IP, Video, storage and data center consolidation
- Affordability and familiarity makes Ethernet the perfect fit for your business
- You get network coverage where ever you do business, whether it's domestic or globally
- Use Ethernet to access the internet or your IP VPN network for better coverage and bandwidth options

Features

- Ethernet can be configured as a private line connecting two locations or a meshed network connecting hundreds of sites
- Whether you require small or large bandwidth you get the speed tiers of 2 Mbps to 10 Gbps
- You'll have stringent service level agreements that will help support your critical applications
- Ethernet works and feels the same in the LAN, MAN or WAN so it's familiar and easy to deploy
- Use Ethernet by itself or as access to the internet and your VPN network for better cost and coverage
- Ensure critical information is delivered with diversity and redundancy options

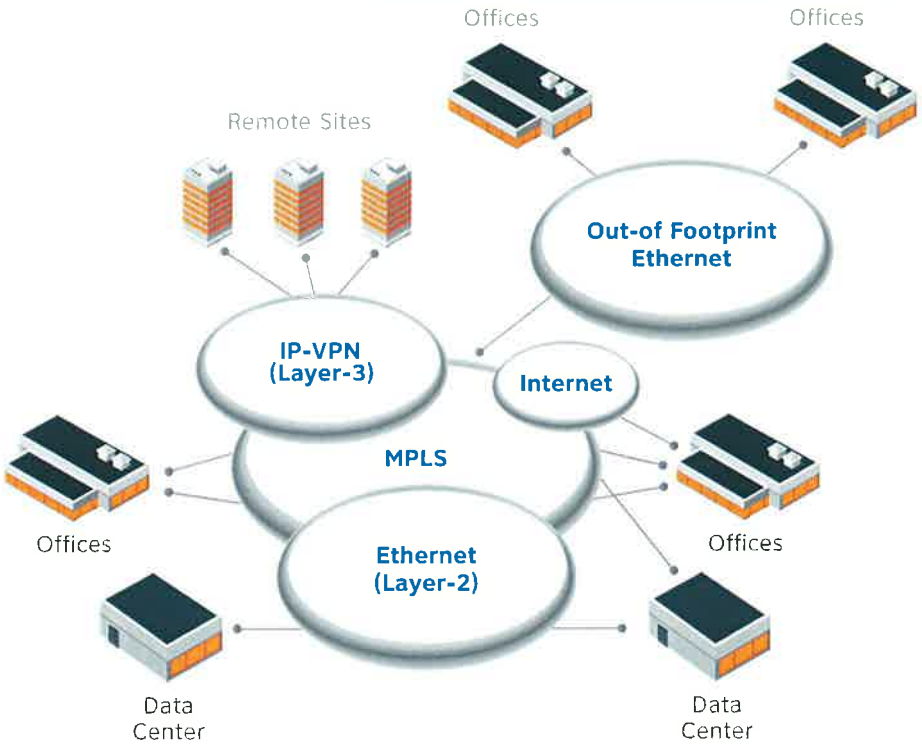
at&t

Performance, Agility and Control

AT&T Ethernet services deliver simplicity and connectivity to new and existing services, for ease of integration with your emerging applications.

- Performance. AT&T offers 24 hours a day, 7 days a week, monitoring and management of your network to help ensure maximum performance of your applications.
- Agility. Ethernet is extended from your Local Area Network to the Metropolitan Area Network and across the Wide Area Network; allowing for simplified Networking solutions around the globe.
- Control. With committed Ethernet data rates you have virtually seamless control of VoIP and IP Telephony services and other networking applications with a simple and consistent transport technology across the Local, Metropolitan or Wide Area Network.

Ethernet Hybrid Network



For more information about what Ethernet can do for you and choosing the right solution, contact your AT&T Representative, or visit us on the web at www.att.com.

Dedicated Internet Access

Reliable Advanced Technology With Connections You Can Count On.

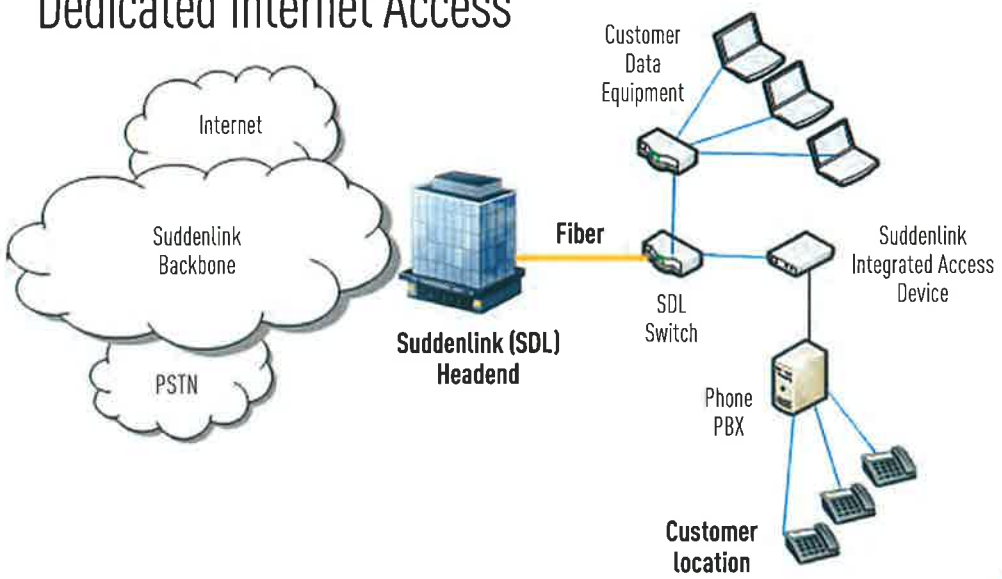
Overview and Benefits:

- DIA is provided to our customers over our fully redundant optical fiber backbone
- Top of the line customer care with complete proactive network monitoring 24/7
- Flexible solutions offer options of scalable speeds and services to meet your business need
- Highly redundant and scalable backbone architecture
- Dedicated resources that constantly monitor backbone traffic
- Customers directly connected to Suddenlink Fiber Network
  - Fast Ethernet 100 Mbps
  - Gigabit Ethernet 200-1,000 Mbps
- Flexible service that easily scales to your ever-growing needs, without disrupting your business or customers
- Online reporting services available to help monitor speeds and performance
- Reliable connectivity over our advanced fiber-based broadband network for constant secure connections
- WAN (Wide Area Network) solutions that make doing business seamless
- Network availability 99.99% guaranteed by our industry leading SLA (Service Level Agreement)
- 24/7 Suddenlink Network Operations Center for reporting service troubles, outages or service interruption

www.suddenlinkbusiness.com

suddenlink business

Dedicated Internet Access



Partnering for Your Success

Suddenlink Business offers the experience and the advanced solutions to help your business maximize security, improve employee efficiency, and help establish a competitive advantage – all while minimizing your costs. And we stand behind you and our services with expert, local support to ensure you remain up and running.

Learn More

Contact one of our local Account Executives to discover how our Dedicated Internet Access (DIA) solutions can help you do more – for less.

Suddenlink Business. One call. One company. Easy.

www.suddenlinkbusiness.com

suddenlink business

Services and features not available in all areas. Multiple public IP addresses subject to the Suddenlink IP address Assignment Policy. BGP routing subject to the Suddenlink BGP peering requirements. All business locations must be located within the Suddenlink footprint. Specific support and equipment repair and replacement obligations may vary depending on terms and conditions of applicable service agreement. Other restrictions may apply.

Advanced Data Solutions

Multi-location Ethernet Service You Can Rely On

Whether you have two locations or 20 locations, Suddenlink Business can cost effectively connect them and you with a robust converged data platform. Building on our advanced Ethernet backbone, you can eliminate communication silos and seamlessly extend your LAN to all your locations, improving collaboration, productivity and success.

Powerful Business Benefits

Simplicity

- Multiple locations and extended LAN over Ethernet
- Shared IP-based applications to even your smallest locations

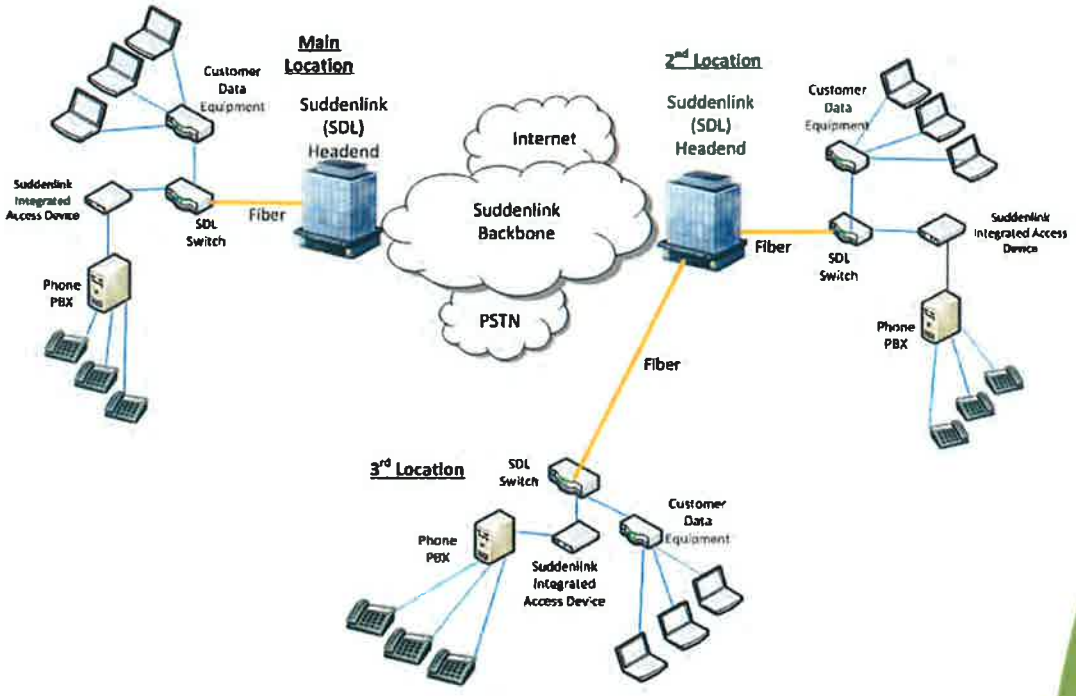
Scalability

- Easily added bandwidth and new locations
- Less complexity and cost compared to older technologies such as T1, frame relay and ATM
- Speeds up to 1 Gbs or more over local metro and inter-metro connections

www.suddenlinkbusiness.com

suddenlink business

Multi Site Voice and Data Solution



Reliability

- Suddenlink Business advanced optical fiber network monitored 24/7 by our national and regional operations centers

Support

- Expert business-class installation, maintenance and service
- Local support teams available 24/7

Expertise

- The leader in your area for providing Ethernet-based network services
- Experience providing advanced communication services to businesses of all sizes and industries

Why wait

Discover how Suddenlink Business advanced data solutions can reliably and cost effectively connect all your locations to help your business reach new levels of productivity, efficiency and success!

www.suddenlinkbusiness.com

suddenlink business

Services and features not available in all areas. Multiple public IP addresses subject to the Suddenlink IP address Assignment Policy. BGP routing subject to the Suddenlink BGP peering requirements. All business locations must be located within the Suddenlink footprint. Specific support and equipment repair and replacement obligations may vary depending on terms and conditions of applicable service agreement. Other restrictions may apply.

ATTACHMENT D
REPORT OF ACOUSTIC MATERIALS DEVELOPMENT FOR MUSICAL INSTRUMENTS

ATA Project No. 64141
Customer Contract #13-174a
February 16, 2015

Funded in part by a CA Community Development Block Grant to the County of Humboldt

Final Report of Acoustic Materials Development for Musical Instruments

Prepared for

County of Humboldt
520 E Street
Eureka, California 95501

Prepared by

ATA Engineering, Inc.
13290 Evening Creek Drive South, Suite 250
San Diego, California 92128

Prepared by:

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Tyler Van Fossen
Engineer

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Jeff Kowtko
Project Engineer

Reviewed by:

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Senior Technical Advisor

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William Fladung	858-480-2058
Tricia Sur	858-480-2125

ABSTRACT

The County of Humboldt has requested testing and materials studies be conducted on rosewood marimba blanks (bars or keys before the tuning process) in an attempt to identify a candidate synthetic material that could replace the rosewood currently needed for higher-quality marimba instruments. ATA Engineering, Inc., (ATA) and subcontracted Carnegie Mellon University (CMU) conducted a series of tests on seventeen C2 rosewood blanks (lowest note on a marimba instrument) from a notable marimba instrument manufacturer. The effort included modal surveys, dynamic modulus analysis, flexural modulus tests, density measurements, literary studies, and environmental scanning electron microscopy.

Results from all tests and studies identified several physical characteristics that were definitively sensitive or insensitive to the C2 blanks' level of quality. Notably, loss coefficient (or damping), and mode symmetry (using modal assurance criteria calculations) were identified as the most obvious characteristics affecting musical quality. Flexural modulus, densities, and microstructure were identified as having little or no direct correlation to marimba blank musical potential.

Conclusions and recommendations for further study are also presented. These include additional modal survey tests and data analysis. Approaches for developing synthetic replacements are presented and include an iterative process involving design, analysis, and testing. Overall, the results contained herein show promise in finding a sustainable synthetic replacement for rosewood instruments given additional testing and a disciplined product development procedure.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

ATA - ATA Engineering, Inc.
CMU - Carnegie Mellon University
DMA - Dynamic mechanical analysis
e-SEM - Environmental scanning electron microscopy
FEA - Finite element analysis
FEM - Finite element model
FRF - Frequency response functions
Hz - Hertz
ICP™[1] - Integrated circuit preamplifier
IMAT - Interface between MATLAB, analysis, and test
MAC - Modal assurance criteria
PCB - PCB Electronics, Inc.
PSMIF - Power spectrum mode indicator function
RMS - Root mean square
TDM Test display model

[1] ICP is a registered trademark of PCB Piezotronics, Inc.

1. INTRODUCTION AND EXECUTIVE SUMMARY

Professional-grade instruments such as the marimba shown in Figure 1-1 are typically made of wood due to its machinability and musically pleasing sounds. However, many of the hardwood species used to produce musical instruments are becoming threatened, and the development of alternative acoustic materials is desirable. Humboldt County wishes to sponsor research in this area and contracted ATA Engineering, Inc., (ATA) to identify which material characteristics produce the highest-quality sound. This final report documents ATA's efforts, including objectives, test setup and instrumentation, test conduct, analysis, and results.

Figure 1-1: Photograph of Marimba One's Izzy, as shown on the www.marimbaone.com website.

1.1. Test Objectives

ATA conducted research to meet the following objectives:

- Clearly identify the acoustical properties of rosewood C2 blanks and compare them to candidate materials.
- Support the creation of a synthetic material for professional-grade instruments such as marimbas and xylophones. The ultimate goal would be the creation of an economical synthetic material that could be commercially manufactured, is visually pleasing, durable, thermally stable, moisture resistant, and homogeneous in the longitudinal direction so that the blanks can be readily machined and tuned to produce the desired musical acoustic response.

1.2. Test Performance and Results

A collection of Honduran rosewood C2 blanks was provided to ATA by a participating marimba instrument manufacturer to quantitatively compare acoustical parameters among four qualitative sound quality tiers (as determined by the aforementioned manufacturer). The tiers were categorized as premium, enhanced, traditional, or bad (unacceptable). ATA performed a series of modal surveys between September 21 and October 2, 2014, and collected conclusive data indicating that a low damping ratio and mode shape symmetry is strongly related to the desired acoustic response.

Material studies were additionally performed by senior students at Carnegie Mellon University in Pittsburgh, Pennsylvania, (CMU) as part of their capstone course. The findings of their research supplement the findings of ATA's test effort—material damping (or loss coefficient) is the dominant material property related to acoustical quality; the lower the loss coefficient, the better the sound quality of the material. Of course other material properties factor into the characteristic timbre of Honduran rosewood, but the loss coefficient was typically the dominant property and accounted for the variation in sound quality among the tested blanks.

2. TEST CONFIGURATION

To help identify which material characteristics influence acoustical quality, ATA performed a series of modal surveys on marimba bar blanks, which are uncut but predrilled rosewood bars with consistent dimensions appropriate for their intended musical notes. This section defines the test configuration, including a description of the marimba bar blanks, test stand and fixturing, and measurement geometry. Section 3 describes test conduct, instrumentation, and methods used during the modal test program.

2.1. Marimba Bar Blanks

Seventeen marimba bar blanks were provided to ATA. All blanks were machined from solid Honduran rosewood with identical dimensions (21 inches long, 3 inches wide, 1 inch thick). The blanks had not been tuned but had the mounting holes for the bar cord already drilled. Figure 2-1 shows the seventeen blanks in no particular order.

Figure 2-1: Honduran rosewood test blanks.

Prior to delivering the blanks to ATA, each one was numbered and categorized into one of four musical quality tiers—bad (or unacceptable), traditional, enhanced, or premium. The breakdown of test blanks by sound quality tier is shown in Table 2-1. Note that an additional blank that was received without a number designation was also presorted into the "bad" tier. This one, for future reference, was labeled only as "bad."

Table 2-1: Breakdown of test blank number by sound quality tier.

Bad	Traditional	Enhanced	Premium
4	6	18	3
15	7	23	12
Bad	10	40	38
	52	79	88
	65		
	95		

2.2. Test Stand and Fixturing

To eliminate outside influences (noise) from the test data, ATA used a sound absorption chamber at their facility in San Diego, California. An acoustic/modal test stand was also designed and constructed to simulate typical marimba boundary conditions for the blanks. An overview of the test setup is shown in Figure 2-2.

Figure 2-2: Acoustic/modal test stand in anechoic chamber.

The test stand consisted primarily of an 80/20® frame and plywood platform, as shown in Figure 2-3. A single test blank was mounted to the stand using standard bar cord at each end of the blank, which was tensioned between two posts near the blank.

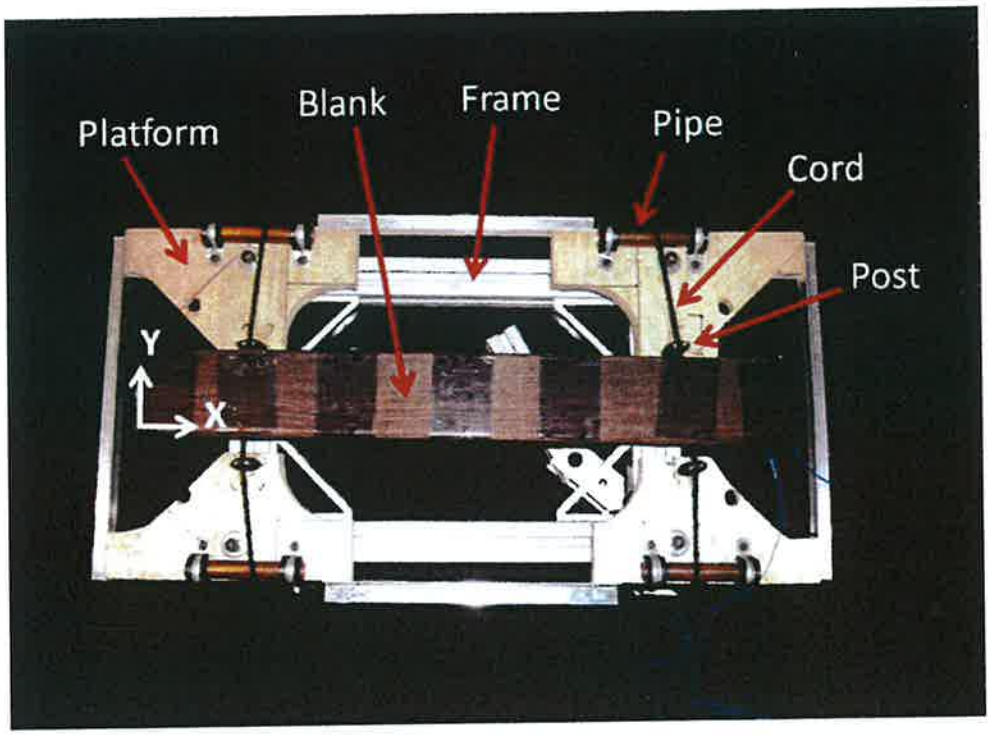


Figure 2-3: Test stand overview.

Tension was applied across the cords by securing the ends of the cords to mounts on the vertical legs of the test stand. One end was clamped at a fixed height, while the other end could be adjusted vertically to control cord tension. A spring was added in line at the adjustable end to help lower the frequency of the rigid body vertical bounce mode and better simulate free-free boundary conditions. The copper pipes at the edges of the test stand served to change the orientation of the cord from horizontal to vertical with minimal friction. Both boundary conditions of the mounting cord are shown in Figure 2-4 and Figure 2-5. Figure 2-5 also shows the microphone mount, which was positioned approximately 4 inches below the test blank at its midpoint. While acoustic data was acquired, ATA did not use this data; the response data from the attached accelerometer produced identical yet much cleaner results.

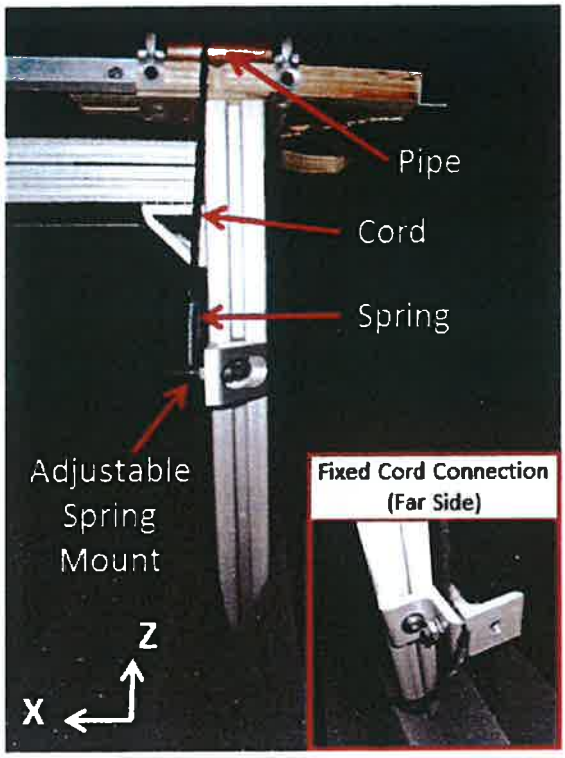


Figure 2-4: Boundary conditions of the mounting cord (front view).

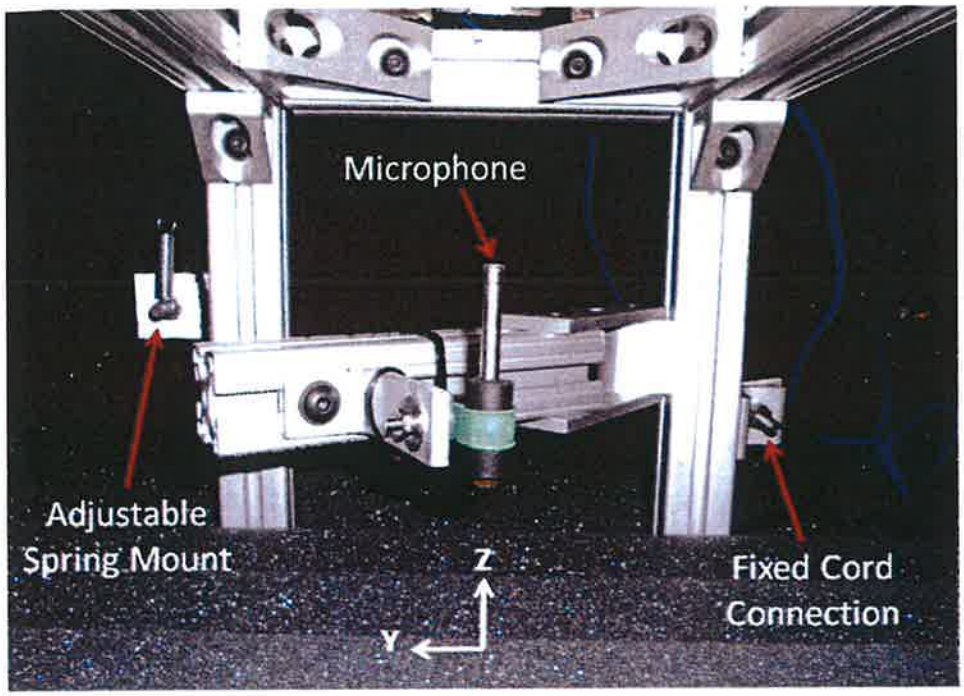


Figure 2-5: Boundary conditions of the mounting cord (side view).

2.3. Test Measurements and Geometry

All test blanks were assigned fourteen measurement locations (101–114) around the perimeter of the upper surface. Figure 2-6 shows the coordinate system and measurement locations on blank number 15. Note that the X direction is along the longitudinal axis of the blank, while the Y direction is in the direction of the upper edge. Following the right-hand rule, the Z direction is up, or out of the page in Figure 2-6.

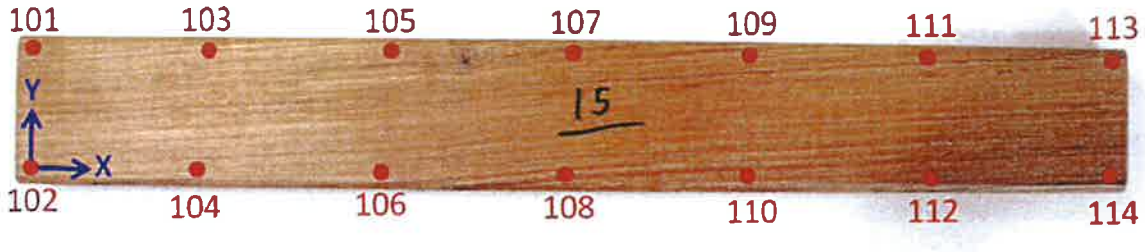


Figure 2-6: Test blank 15 with coordinate system and measurement locations shown.

Measurement locations were evenly spaced (3.5-inch spacing) along the x-axis of the blank. Table 2-2 shows the dimensions of each measurement location (node) with the origin located in the lower left-hand corner of the blank. Note that nodes were moved in from the edge of the blank slightly during testing to allow for solid contact by the impact hammer (see section 3.1).

Table 2-2: Dimensions of the measurement locations.

	Dimensions [in]		
Node	X	Y	Z
101	0.0	2.9	0.0
102	0.0	0.0	0.0
103	3.5	2.9	0.0
104	3.5	0.0	0.0
105	7.0	2.9	0.0
106	7.0	0.0	0.0
107	10.5	2.9	0.0
108	10.5	0.0	0.0
109	14.0	2.9	0.0
110	14.0	0.0	0.0
111	17.5	2.9	0.0
112	17.5	0.0	0.0
113	21.0	2.9	0.0
114	21.0	0.0	0.0

3. TEST DESCRIPTION

Modal testing was performed in a sound absorption chamber at ATA's facility in San Diego, California, from September 21 to October 2, 2014. Excitation force was provided and measured by impacting the test blanks with a modal hammer at predefined measurement locations (defined in section 2.3), as shown in Figure 3-1. The response of the test blank was measured at a single location on the underside of the blank (node 113). Frequency response functions were computed between the excitation and response locations from which to estimate the modal frequencies and damping ratios. The principle of reciprocity allowed each input location to be considered as a degree of freedom (DOF) in the resulting mode shapes.

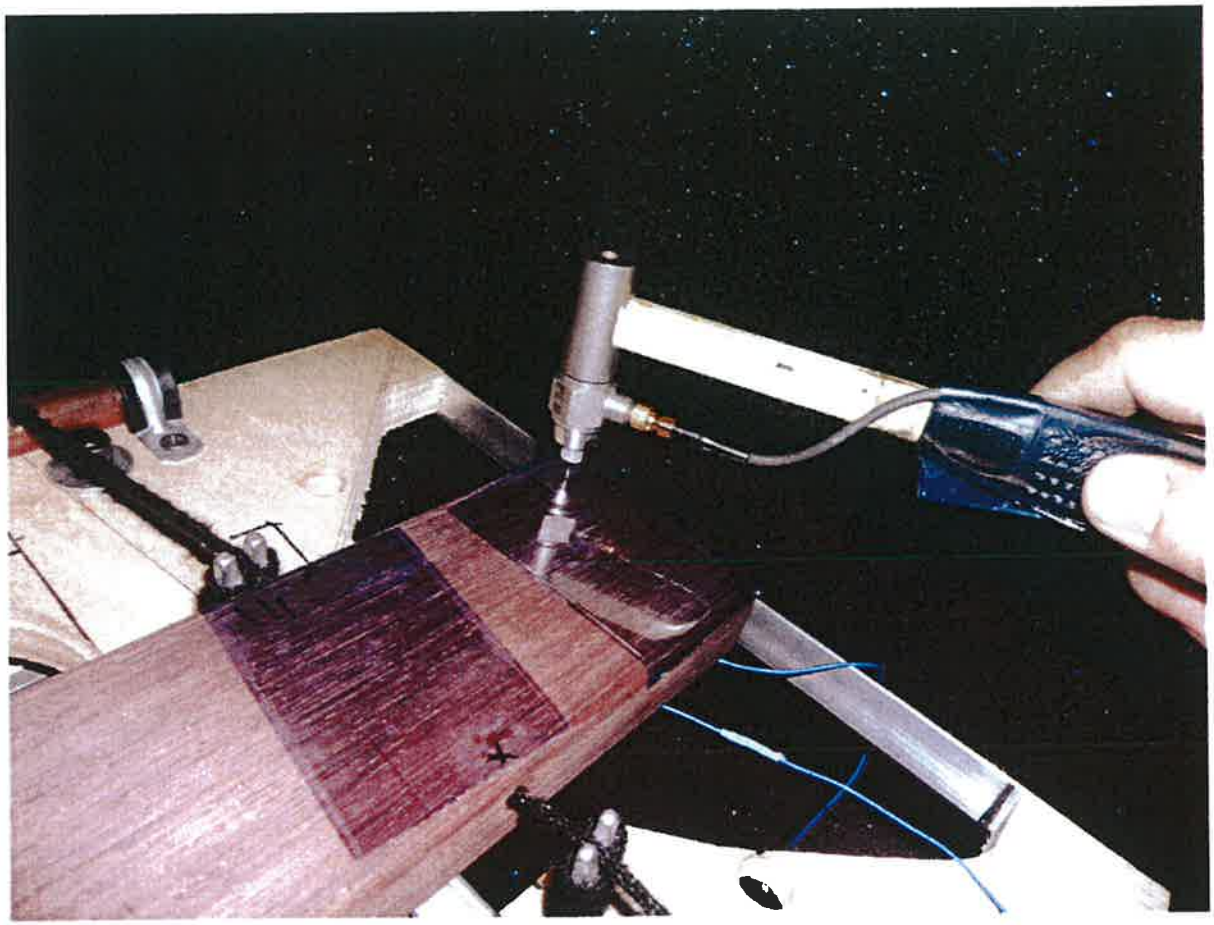


Figure 3-1: Example of a modal impact at location 113Z−.

3.1. Modal Test Conduct

A total of forty test runs were recorded between September 21 and October 2, 2014, including baseline noise measurements and impact testing of all test blanks. A single test run included multiple impact locations and multiple impacts at each location, thus allowing capture of the average response. Sufficient data was collected to compute all mode shapes and associated frequencies and damping in the frequency range of interest. After an initial investigation using all node locations defined in section 2.3, it was determined that only four or five of the nodes were necessary to capture and distinguish all modes of

interest. The four nodes typically included in the Z direction were 101, 102, 113, and 114, which were used to excite the dominant modes considered for musical quality.

The test run log, shown in Table 3-1, was maintained to document the test program. In addition to run number, date, and time, the log documents the test blank number used during each run, along with a description of the run. Testing was initially conducted with a single accelerometer on the underside of the test blank at node 113 in the Z− (vertical) direction but was repeated with accelerometers in the X+ (longitudinal) and Y− (lateral) directions as well (impacts were also made in these directions). Also note that some runs incorporated additional node locations as needed for the longitudinal and lateral directions.

Table 3-1: Modal test run log.

Run #	Date	Start Time	Exc. Type*	Blank #	Filename	Freq Range (Hz)	Notes
Accelerometer located at 113Z-, roving hammer							
1	9/21/2014	13:07	ac	Bad	Run_001ac_bad_freefree.ati	0-25600	Broadband acoustic measurement (ambient noise)
2	9/21/2014	15:02	ac	Bad	Run_002ac_bad_freefree.ati	0-25600	Broadband acoustic measurement (ambient noise)
3	9/21/2014	15:08	i	Bad	Run_003i_bad_freefree.ati	0-25600	impact all points (101Z- through 114Z-)
4	9/21/2014	16:02	i	Bad	Run_004i_bad_freefree.ati	0-25600	impact at 107Z- using different mallets: DHB2, DHB3-B, KMR2
5	9/22/2014	9:56	i	4	Run_005i_4_freefree.ati	0-25600	impact all points (101Z- through 114Z-)
6	9/22/2014	11:46	i	65	Run_006i_65_freefree.ati	0-25600	impact at 101Z-, 102Z-, 113Z-, 114Z-
7	9/22/2014	13:25	i	95	Run_007i_95_freefree.ati	0-25600	impact at 101Z-, 102Z-, 113Z-, 114Z-
8	9/22/2014	13:54	i	12	Run_008i_12_freefree.ati	0-25600	impact at 101Z-, 102Z-, 113Z-, 114Z-
9	9/22/2014	14:24	i	12	Run_009i_12_freefree.ati	0-25600	Check repeatability, impact at 101Z-, 102Z-, 113Z-, 114Z-
10	9/22/2014	14:45	i	3	Run_010i_3_freefree.ati	0-25600	impact at 101Z-, 102Z-, 113Z-, 114Z-
11	9/22/2014	15:29	i	88	Run_011i_88_freefree.ati	0-25600	impact at 101Z-, 102Z-, 113Z-, 114Z-
12	9/23/2014	10:28	i	15	Run_012i_15_modal.ati	0-25600	impact at 101Z-, 102Z-, 113Z-, 114Z-
13	9/23/2014	11:06	i	7	Run_013i_7_modal.ati	0-25600	impact at 101Z-, 102Z-, 113Z-, 114Z-
14	9/23/2014	11:41	i	38	Run_014i_38_modal.ati	0-25600	impact at 101Z-, 102Z-, 113Z-, 114Z-
15	9/24/2014	7:43	i	40	Run_015i_40_modal.ati	0-25600	impact at 101Z-, 102Z-, 113Z-, 114Z-
16	9/24/2014	8:09	i	79	Run_016i_79_modal.ati	0-25600	impact at 101Z-, 102Z-, 113Z-, 114Z-
17	9/24/2014	8:41	i	52	Run_017i_52_modal.ati	0-25600	impact at 101Z-, 102Z-, 113Z-, 114Z-
18	9/24/2014	9:00	i	6	Run_018i_6_modal.ati	0-25600	impact at 101Z-, 102Z-, 113Z-, 114Z-
19	9/24/2014	9:20	i	18	Run_019i_18_modal.ati	0-25600	impact at 101Z-, 102Z-, 113Z-, 114Z-
20	9/24/2014	10:02	i	23	Run_020i_23_modal.ati	0-25600	impact at 101Z-, 102Z-, 113Z-, 114Z-
21	9/24/2014	10:34	i	10	Run_021i_10_modal.ati	0-25600	impact at 101Z-, 102Z-, 113Z-, 114Z-
22	9/24/2014	11:29	i	tuned	Run_022i_tuned_modal.ati	0-25600	impact all points (101Z- through 114Z-)
Accelerometers located at 113X+Y-, roving hammer							
23	9/30/2014	11:01	i	Bad	Run_023i_bad_modal.ati	0-25600	impact at 101Z-, 102Y-Z-, 113X+Z-, 114X+Z-
24	9/30/2014	14:49	i	12	Run_024i_12_modal.ati	0-25600	impact at 101Z-, 102Y-Z-, 108Y-, 113X+Y-, 114X+Z-
25	9/30/2014	15:19	i	7	Run_025i_7_modal.ati	0-25600	impact at 101Z-, 102Y-Z-, 108Y-, 113X+Y-Z-, 114X+Z-
26	10/1/2014	11:39	i	65	Run_026i_65_modal.ati	0-25600	impact at 101X+Y-Z-, 102X+Z-, 103Y-, 105Y-, 107Y-, 109Y-, 111Y-, 113X-Y-Z-, 114X-Z-
27	10/1/2014	14:23	i	95	Run_027i_95_modal.ati	0-25600	impact 101X+Y-,102X+,107Y-,113Y-
28	10/1/2014	14:53	i	4	Run_028i_4_modal.ati	0-25600	impact 101X+Y-,102X+,107Y-,113Y-
29	10/1/2014	15:23	i	15	Run_029i_15_modal.ati	0-25600	impact 101X+Y-,102X+,107Y-,113Y-
30	10/1/2014	15:43	i	88	Run_030i_88_modal.ati	0-25600	impact 101X+Y-,102X+,107Y-,113Y-
31	10/1/2014	16:23	i	3	Run_031i_3_modal.ati	0-25600	impact 101X+Y-,102X+,107Y-,113Y-
32	10/2/2014	7:49	i	52	Run_032i_52_modal.ati	0-25600	impact 101X+Y-,102X+,107Y-,113Y-
33	10/2/2014	11:36	i	79	Run_033i_79_modal.ati	0-25600	impact 101X+Y-,102X+,107Y-,113Y-
34	10/2/2014	12:44	i	38	Run_034i_38_modal.ati	0-25600	impact 101X+Y-,102X+,107Y-,113Y-
35	10/2/2014	13:03	i	40	Run_035i_40_modal.ati	0-25600	impact 101X+Y-,102X+,107Y-,113Y-
36	10/2/2014	13:38	i	10	Run_036i_10_modal.ati	0-25600	impact 101X+Y-,102X+,107Y-,113Y-
37	10/2/2014	13:59	i	23	Run_037i_23_modal.ati	0-25600	impact 101X+Y-,102X+,107Y-,113Y-
38	10/2/2014	14:15	i	18	Run_038i_18_modal.ati	0-25600	impact 101X+Y-,102X+,107Y-,113Y-
39	10/2/2014	15:15	i	6	Run_039i_6_modal.ati	0-25600	impact 101X+Y-,102X+,107Y-,113Y-
40	10/2/2014	15:36	i	tuned	Run_040i_tuned_modal.ati	0-25600	impact at 101X+Y-, 102X+, 103Y-, 105Y-, 107Y-, 109Y-, 111Y-, 113X-Y-, 114X-

* EXCITATION TYPE

ac acoustic measurement

i modal impact

3.2. Test Instrumentation

Testing was performed using a modal impact hammer, accelerometers, and a data acquisition system. This section summarizes the specifications of the test instrumentation; refer to Appendix A for more complete technical specifications. Note that a microphone was also used to record acoustic data, but this data was not used since the accelerometer produced identical yet cleaner frequency response functions.

3.2.1. Modal Hammer

A modal impact hammer, shown in Figure 3-2, was used to excite the test blank at measurement locations defined in section 2.3. The hammer consisted of a calibrated force sensor and mass with interchangeable tips. A hard tip was selected to provide broadband excitation up to and exceeding 10 kHz. A PCB model 208A03 integrated circuit preamplifier (ICP®) force transducer was used, which has a ±500 pound range and 0.02 pound resolution. The impact hammer with integrated ICP force sensor calibration information can be found in Appendix B.

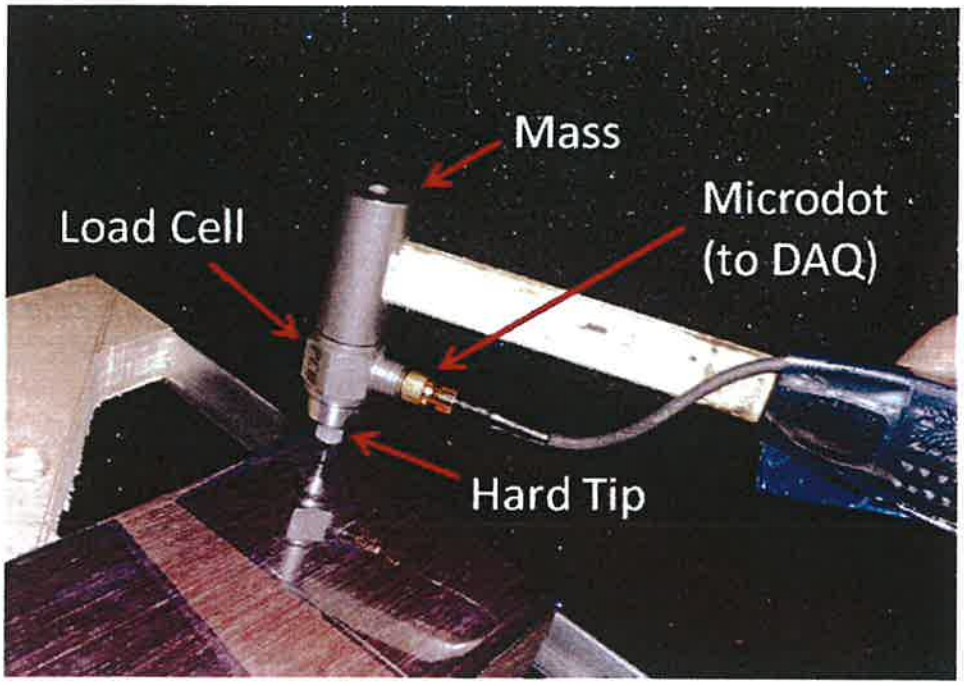


Figure 3-2: Impact hammer.

3.2.2. Accelerometers

Miniature teardrop-type accelerometers were used to measure the response of the test blank at a single measurement location (node 113). PCB model 352A21 ICP type accelerometers were used (shown in Figure 3-3), which have a 500 g peak range in the frequency range of 1–10,000 Hz and a 0.002 g resolution. Due to their small size, the added weight of the accelerometers on the test blanks was negligible (0.02 ounces). A maximum of two accelerometers were used during any given test run. For reference, accelerometer calibration information is found in Appendix B.

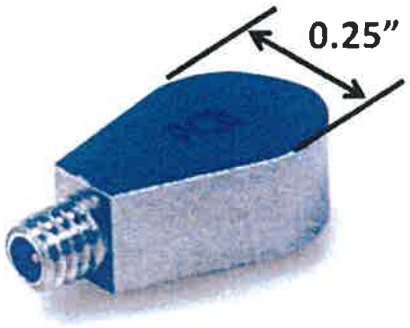


Figure 3-3: PCB 352A21 accelerometer.

3.2.3. Data Acquisition System

A six-channel Brüel and Kjær LAN-XI digitizing front-end hardware system (Figure 3-4) was used to both power the transducers and collect test data. Communication with the data acquisition module was established through Brüel & Kjær, I-deas® Test software installed on a laptop computer. Both the excitation force and accelerometer response(s) were acquired simultaneously at a sample frequency of 65,536 Hz.

Data was processed using ATA's IMAT™ software package installed on the data acquisition computer. All time-history and FRF data were stored on the hard disk of the laptop computer and copied to ATA's server at the conclusion of each test day. Processing included extraction of modal frequencies and damping ratios from the FRF.

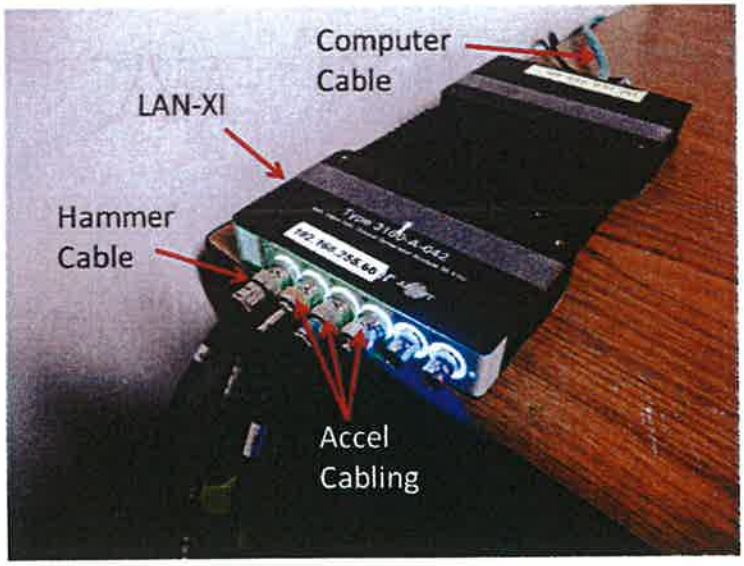


Figure 3-4: LAN-XI data acquisition system.

3.3. Test Performance

One computer was used to acquire data and extract modal parameter information from the FRF data. The FRF data were processed to determine the resonant frequencies, modal damping, and mode shapes.

Preliminary data analysis was performed as soon as the FRF were available for processing. This allowed for data quality to be verified through the use of coherence and FRF quality.

3.3.1. Data Quality Assessment

Data quality was evaluated immediately after the collection of each data set by examining the force spectra, coherence, and FRF quality. Multiple impacts with the modal hammer were captured at each measurement location to compute the average response. Each impact was manually reviewed and accepted only if a clean excitation signal was captured.

Coherence functions that were computed during the acquisition process were all stored, along with the auto spectrum and FRF for each channel. This way any questions about data quality could be assessed by reviewing specific coherence functions associated with a particular response measurement. An example coherence function and FRF are shown in Figure 3-5 for run 65, impacting at node 101.

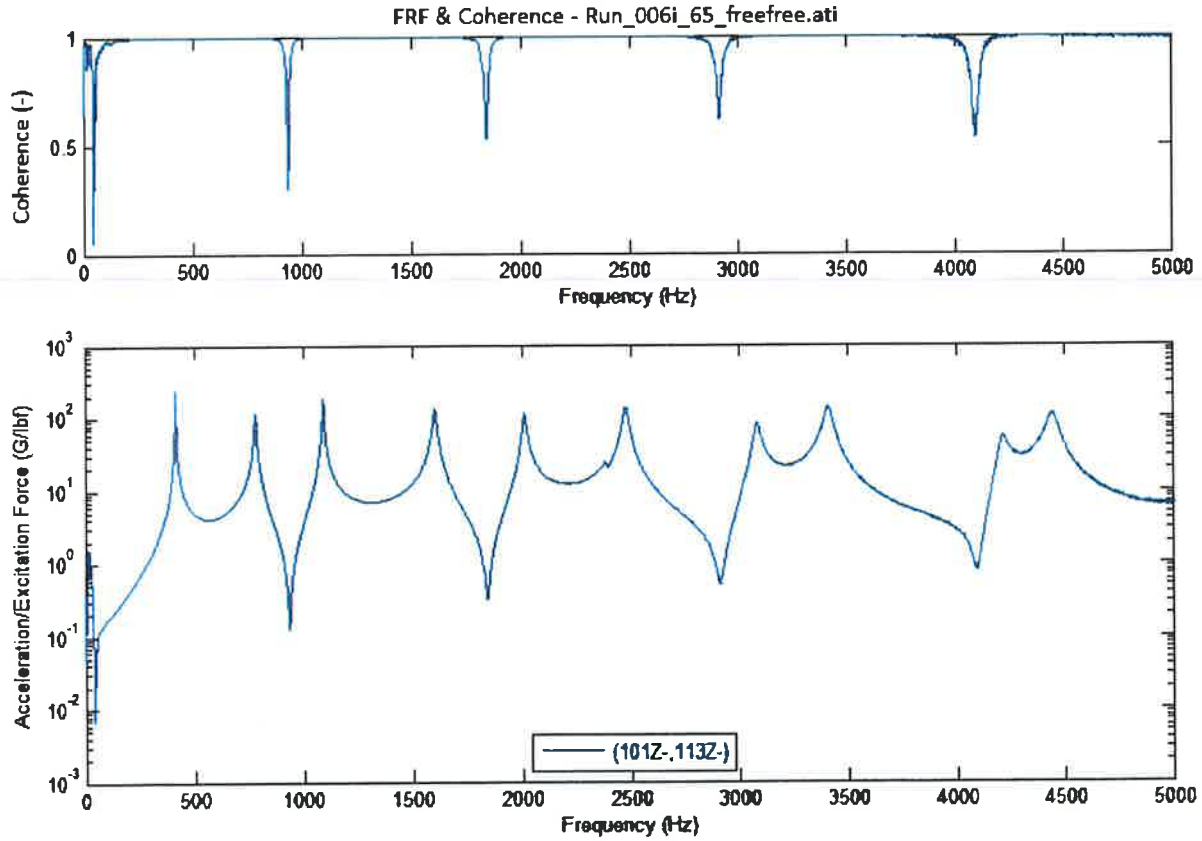


Figure 3-5: Example FRF and coherence measurement for run 65, impact at node 101.

According to the principle of reciprocity, an FRF between an input at a location A and an output at a location B is the same as an FRF between an input at B and an output at A In this manner, the fixed-location accelerometer is the reference and the impact locations become the response DOF of the mode shapes. An assumption was made based on this principle that the FRF between reference and response locations and the FRF between response and reference locations are identical. In this manner, the

accelerometer was assumed to be the reference (excitation location), while the impact locations were assumed to be the responses (measurement locations).

3.3.2. Modal Extraction

The first indications of resonance were determined by evaluating the FRF. Peaks showing dynamic amplification were tagged for documentation. All of the modal parameters were extracted from the FRF. These modal parameters include the natural frequency, damping, and corresponding mode shapes. FRF for all test blanks can be found in Appendix C.

The alias-free polyreference algorithm AFPoly™ in ATA's IMAT toolkit was the primary method used to extract the modal information from the test data. Real normal modes were computed directly from the test data. Damping was estimated using the same polyreference FRF curve-fitting algorithm that was used to extract the resonant frequencies. Mode shapes were identified by animating the measured response on a test display model (TDM). Final listings of modal frequencies, shapes, and damping estimates are provided in section 4.

4. MODAL SURVEY TEST RESULTS

ATA completed modal surveys on seventeen marimba blanks, identifying the natural frequencies and damping for the first fourteen flexible modes. The modes identified include all three orthogonal directions.

The following subsections detail the results from the modal survey and offer several interpretations of those results in an attempt to better distinguish the characteristics of marimba blanks that directly relate to quality level. In addition, a summary of results from the CMU materials study is presented, relating other physical characteristics to quality levels. The accumulation of knowledge from the results presented by ATA and CMU is intended to aid in the selection of a synthetic material replacement for the tested rosewood.

4.1. Modal Frequencies

The first fourteen modes, including lateral and longitudinal, were characterized and are presented in Table 4-1. Note that an additional blank was on hand and classified as "bad" because it was not given an official number.

Table 4-1: Modal frequencies of marimba blanks.

		Modal Frequencies (Hz)													
Quality Tier	Sample #	1st Bending	1st Torsion	1st Lateral Bending	2nd Bending	2nd Torsion	3rd Bending	2nd Lateral Bending	3rd Torsion	4th Bending	4th Torsion	3rd Lateral Bending	5th Bending	1st Axial	6th Bending
Premium	3	406	768	1032	1076	1577	2004	2288	2447	3113	3412	3642	4325	4418	4481
	12	397	812	1023	1050	1645	1950	2317	2536	3021	3502	3738	4198	4325	4555
	38	419	772	1089	1105	1580	2043	2341	2459	3154	3425	3707	4361	4567	4491
	88	407	740	1033	1083	1517	2005	2267	2374	3103	3311	3573	4288	4442	4364
Enhanced	18	418	797	1073	1100	1620	2022	2387	2497	3105	3460	3809	4276	4571	4502
	23	384	801	999	1019	1634	1903	2256	2520	2975	3484	3652	4154	4177	4542
	40	406	808	1056	1072	1644	1988	2372	2527	3075	3488	3802	4252	4426	4554
	79	416	800	1059	1096	1624	2021	2361	2512	3109	3480	3777	4291	4543	4525
Traditional	6	431	781	1106	1126	1592	2059	2406	2471	3151	3440	3789	4297	4710	4512
	7	391	801	1023	1024	1624	1920	2311	2502	2983	3446	3728	4150	4279	4485
	10	416	767	1036	1096	1569	2023	2289	2427	3115	3388	3644	4287	4551	4414
	62	416	771	1074	1099	1572	2030	2359	2448	3118	3408	3742	4281	4569	4460
	65	419	786	1078	1097	1604	2012	2386	2475	3082	3414	3805	4215	4591	4447
	66	379	771	982	1012	1584	1883	2215	2445	2937	3384	3587	4082	4120	4425
Bad	4	375	799	950	1003	1632	1884	2201	2514	2938	3481	3802	4035	4033	4145
	15	439	771	1110	1150	1568	2073	2400	2455	3108	3446	3746	4208	4855	4534
	Bad	355	773	930	944	1558	1775	2109	2384	2764	3339	3395	3837	3825	4387
Std Dev		22	19	49	52	36	79	81	47	102	54	111	129	260	100
Mean		405	783	1038	1088	1597	1976	2310	2470	3050	3430	3689	4208	4412	4460
Median		407	781	1036	1083	1592	2005	2317	2471	3103	3440	3728	4252	4442	4485
Max		439	812	1110	1150	1645	2073	2408	2536	3154	3502	3809	4361	4855	4555
Min		355	740	930	944	1517	1775	2109	2374	2764	3311	3395	3837	3825	4145

Various colors are used to distinguish certain characteristics of the data. In the first row, where the mode shapes are described, the text colors correspond to different shape types: green represents vertical bending modes, red corresponds to torsional modes, blue is used to indicate lateral bending modes, and magenta

distinguishes the single axial mode. Conditional formatting has been applied to the cells containing the frequency numbers. Each column representing a mode contains its own format range, in which the lowest frequency is green and the highest frequency is in red. This was done in an effort to determine whether a correlation—or lack thereof—could be recognized between quality categories. Looking at frequencies alone, an obvious pattern was not identified. It was therefore necessary to investigate other relationships to find correlations between the data and marimba blank quality.

Previous discussions with master marimba instrument tuners revealed that relationships between modes can have a significant impact on the overall musical quality of the resulting tuned bar, particularly the torsional modes. Therefore a number of ratios were computed to determine whether a pattern is present among frequency ratios. Table 4-2 summarizes this effort, using similar conditional formatting to enhance pattern visualization. Blue highlighted values are maximum values while orange represents lower and minimum values.

Table 4-2: Modal frequency ratio comparisons.

		Frequency Ratio								
		1st Bending vs...				1st Torsion vs...				
Quality Tier	Sample #	1st Torsion	2nd Bending	2nd Torsion	1st Axial	2nd Bending	2nd Torsion	3rd Bending	1st Axial	1st Axial vs. 2nd Bending
Premium	3	1.39	2.65	3.86	10.87	1.40	2.05	2.61	5.76	4.11
	12	2.04	2.64	4.14	10.86	1.29	2.03	2.40	5.32	4.12
	38	1.84	2.64	3.77	10.99	1.43	2.05	2.65	5.91	4.13
	88	1.82	2.66	3.72	10.99	1.46	2.05	2.71	6.00	4.10
Enhanced	15	1.91	2.63	3.88	10.94	1.38	2.03	2.54	5.73	4.15
	23	2.09	2.65	4.25	10.87	1.27	2.04	2.38	5.22	4.10
	45	1.99	2.64	4.05	10.89	1.33	2.04	2.46	5.48	4.13
	78	1.92	2.63	3.90	10.91	1.37	2.03	2.53	5.68	4.14
Traditional	6	1.81	2.61	3.69	10.92	1.44	2.04	2.63	6.03	4.18
	7	2.05	2.62	4.15	10.93	1.28	2.03	2.40	5.34	4.18
	10	1.84	2.63	3.77	10.93	1.43	2.04	2.64	5.93	4.15
	62	1.85	2.64	3.78	10.99	1.43	2.04	2.63	5.92	4.16
	65	1.87	2.62	3.82	10.95	1.40	2.04	2.56	5.64	4.19
	98	2.03	2.67	4.18	10.87	1.31	2.06	2.44	5.35	4.07
Bad	4	2.13	2.67	4.35	10.76	1.25	2.04	2.36	5.05	4.02
	15	1.76	2.62	3.57	11.07	1.49	2.03	2.69	6.29	4.22
	Bad	2.18	2.66	4.39	10.78	1.22	2.01	2.30	4.95	4.05
Std Dev		0.12	0.02	0.25	0.07	0.08	0.01	0.13	0.38	0.05
Mean		1.94	2.64	3.96	10.90	1.36	2.04	2.52	5.64	4.13
Median		1.91	2.64	3.88	10.90	1.39	2.04	2.54	5.73	4.13
Max		2.18	2.67	4.39	11.07	1.49	2.06	2.71	6.29	4.22
Min		1.76	2.61	3.57	10.76	1.22	2.01	2.30	4.95	4.02

In this representation we look at frequency ratios to determine if spacing, in hertz, between modes is a driver for musical quality. Similar to Table 4-1, the data cells for each column are colored based on their value, with orange for the smallest ratio and blue for the highest ratio. The ratios are calculated using the higher-frequency mode as the numerator and the lower-frequency mode for the denominator. The results in this comparison are inconclusive, as no prominent pattern stands out. This is not unexpected, however, since the tuning process alters these frequencies significantly before the tuned bar is ready for the musician.

4.2. Modal Damping

Damping (or loss factor) computed from the modal survey is summarized in Table 4-3. The results here strongly suggest that, in most cases, lower damping coincides with increased musical quality.

Table 4-3: Modal damping of marimba blanks.

		Damping %													
Quality Tier	Sample #	1st Bending	1st Torsion	1st Lateral Bending	2nd Bending	2nd Torsion	3rd Bending	2nd Lateral Bending	3rd Torsion	4th Bending	4th Torsion	3rd Lateral Bending	5th Bending	1st Axial	6th Bending
Premium	3	0.16	0.39	0.23	0.20	0.36	0.32	0.28	0.37	0.33	0.39	0.34	0.34	0.21	0.43
	12	0.17	0.40	0.25	0.21	0.37	0.32	0.29	0.38	0.34	0.40	0.34	0.34	0.23	0.44
	38	0.17	0.40	0.22	0.19	0.36	0.31	0.27	0.38	0.32	0.39	0.33	0.33	0.18	0.44
	88	0.18	0.39	0.23	0.22	0.37	0.33	0.30	0.38	0.35	0.42	0.36	0.36	0.25	0.45
Enhanced	18	0.19	0.43	0.25	0.22	0.40	0.36	0.30	0.40	0.37	0.44	0.36	0.39	0.20	0.49
	23	0.18	0.38	0.22	0.20	0.36	0.33	0.27	0.37	0.34	0.41	0.33	0.30	0.23	0.45
	40	0.18	0.41	0.24	0.22	0.38	0.35	0.29	0.39	0.36	0.44	0.35	0.37	0.23	0.48
	78	0.20	0.41	0.24	0.22	0.38	0.35	0.30	0.39	0.36	0.43	0.37	0.38	0.27	0.38
Traditional	[redacted]	0.22	0.46	0.29	0.28	0.43	0.41	0.34	0.44	0.42	0.47	0.39	0.46	0.27	0.50
	7	0.21	0.45	0.28	0.27	0.43	0.38	0.35	0.44	0.39	0.48	0.41	0.41	0.24	0.53
	10	0.21	0.46	0.28	0.26	0.46	0.40	0.36	0.46	0.41	0.49	0.42	0.43	0.27	0.56
	[redacted]	0.23	0.46	0.28	0.27	0.43	0.39	0.35	0.43	0.42	0.46	0.40	0.43	0.28	0.51
	[redacted]	0.23	0.50	0.30	0.26	0.46	0.40	0.36	0.47	0.40	0.50	0.42	0.38	0.28	0.54
	[redacted]	0.24	0.51	0.33	0.29	0.48	0.42	0.40	0.48	0.45	0.51	0.44	0.45	0.28	0.56
Bad	4	0.21	0.39	0.26	0.23	0.40	0.35	0.30	0.39	0.36	0.41	0.35	0.29	0.28	0.36
	15	0.25	0.49	0.34	0.31	0.47	0.43	0.38	0.48	0.48	0.49	0.45	0.54	0.29	0.59
	Bad	0.21	0.46	0.29	0.24	0.43	0.40	0.37	0.44	0.44	0.47	0.41	0.42	0.32	0.54
	Std Dev	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.05	0.04	0.04	0.06	0.04	0.06
	Mean	0.21	0.44	0.27	0.25	0.41	0.37	0.33	0.42	0.38	0.45	0.38	0.39	0.25	0.48
	Median	0.21	0.43	0.26	0.23	0.40	0.36	0.30	0.40	0.37	0.44	0.37	0.38	0.27	0.49
	Max	0.31	0.51	0.34	0.34	0.48	0.43	0.40	0.48	0.48	0.51	0.45	0.54	0.32	0.58
	Min	0.16	0.38	0.22	0.19	0.36	0.31	0.27	0.36	0.32	0.39	0.33	0.29	0.18	0.36

The table presented here is conditionally formatted so that data for each mode (column) is highlighted between green (minimum) and red (maximum). The color corresponds to the critical damping percent and is not scaled between modes; that is, 0.16% damping is the lowest for mode 1 (first bending), while 0.38% damping is the lowest for mode 2 (first torsional), and both cells are highlighted with the same color.

The resulting visual pattern implies that musical quality is proportional to low damping with some exceptions. Notably, blank 4 demonstrates reasonably good damping qualities but was classified as "bad." This suggests that other characteristics in addition to damping influence quality. In the case of blank 4, there is strong evidence to suggest that at least one other characteristic or inter-physical relationship of the blank can completely overrule the low-damping criterion established here for measuring musical quality. Also, one might expect blank 65 to fall into the "bad" category as well, since its damping properties appear to be similar to blank 15. In section 6.1, we discuss how blank 65 was actually recategorized to "bad" as a result of the final tuning effort.

Further investigations to reveal other trends included computing damping ratios between modes, shown in Table 4-4, identical to the format of Table 4-2 for frequency ratio comparisons.

Table 4-4: Modal damping ratios.

		Damping % Ratio								
		1st Bending vs...				1st Torsion vs...				
Quality Tier	Sample #	1st Torsion	2nd Bending	2nd Torsion	1st Axial	2nd Bending	2nd Torsion	3rd Bending	1st Axial	1st Axial vs. 2nd Bending
Premium	3	2.41	1.21	2.22	1.32	0.50	0.92	0.82	0.55	1.09
	12	2.36	1.23	2.23	1.36	0.52	0.94	0.81	0.58	1.11
	38	2.33	1.14	2.11	1.07	0.49	0.91	0.79	0.46	0.93
	88	2.18	1.22	2.09	1.41	0.56	0.96	0.85	0.65	1.16
Enhanced	18	2.30	1.16	2.16	1.10	0.50	0.94	0.84	0.48	0.95
	23	2.06	1.07	1.94	1.25	0.52	0.94	0.86	0.61	1.16
	40	2.22	1.22	2.10	1.26	0.55	0.94	0.89	0.57	1.03
	75	2.07	1.12	1.93	1.33	0.54	0.93	0.84	0.64	1.19
Traditional	6	2.08	1.26	1.96	1.22	0.61	0.94	0.90	0.59	0.97
	7	2.20	1.29	2.10	1.17	0.59	0.96	0.85	0.53	0.91
	10	2.30	1.22	2.15	1.28	0.53	0.93	0.81	0.55	1.05
	33	2.00	1.18	1.86	1.20	0.59	0.93	0.85	0.59	1.02
	58	2.18	1.14	2.03	1.24	0.52	0.93	0.79	0.57	1.09
	65	2.11	1.22	1.99	1.16	0.58	0.94	0.82	0.55	0.95
Bad	4	1.82	1.10	1.87	1.30	0.61	1.03	0.91	0.72	1.19
	15	1.98	1.23	1.89	1.17	0.62	0.95	0.88	0.59	0.96
	Bad	1.50	1.10	1.39	1.03	0.74	0.93	0.87	0.69	0.94
Std Dev		0.22	0.06	0.20	0.10	0.06	0.03	0.03	0.07	0.10
Mean		2.12	1.18	2.00	1.23	0.56	0.94	0.85	0.58	1.04
Median		2.18	1.21	2.03	1.24	0.55	0.94	0.85	0.58	1.03
Max		2.41	1.29	2.23	1.41	0.74	1.03	0.91	0.72	1.19
Min		1.50	1.07	1.39	1.03	0.49	0.91	0.79	0.46	0.91

Patterns arise that suggest inter-modal damping ratios are significant. Notably, the damping ratio of the first bending mode to the first and second torsion mode shows a trend that higher ratio means higher musical quality. Note that blanks 18 and 10 both exhibit damping ratios associated with "premium" quality, even though they were classified by marimba tuners as "enhanced" and "traditional," respectively. In section 6.1, we discuss how the quality of blank 10 comes into question after tuning.

Blank 4 demonstrates lower damping ratios of the first bending mode versus the first and second torsion modes when compared against all other blanks rated "traditional" or higher. Although the overall damping in the blank lends itself to "traditional" or even "enhanced" status, consideration given to the damping ratios puts the blank squarely in the "bad" category.

Blanks 10, 18, and 4 strengthen an argument that other physical characteristics besides overall damping determine marimba blank quality. It appears conclusive here that relationships between modes are important to quantify.

4.3. Modal Response Magnitudes

The remaining modal characteristic that can be used for comparisons is the response magnitude of the blanks' modes. This process required the calculation of power spectrum mode indicator functions (PSMIF), the summation of all FRF multiplied by each FRF conjugate. The number of FRF summed was the same for all blanks tested. This produces a frequency-domain function that can be used to compare

mode amplitudes against each other and PSMIFs generated from different blanks. Table 4-5 is a summary of the magnitude comparisons, using the same conditional formatting technique previously employed for frequency and damping comparisons in sections 4.1 and 4.2.

Table 4-5: Power spectrum mode indicator function amplitudes of marimba blank modes.

		Amplitude (G/Lbf)/1000									
Quality Tier	Sample #	1st Bending	1st Torsion	2nd Bending	2nd Torsion	3rd Bending	3rd Torsion	4th Bending	4th Torsion	5th Bending	6th Bending
Premium	3	597	125	408	177	118	187	92	161	75	108
	12	481	101	392	131	123	135	94	116	71	80
	38	648	136	386	189	110	197	89	173	71	108
	88	417	111	252	153	67	152	45	137	33	84
Enhanced	18	520	41	301	56	87	58	66	47	45	34
	23	520	165	350	225	69	240	58	216	31	181
	40	517	129	300	168	85	178	72	144	53	101
	79	417	105	275	138	82	141	61	120	47	65
Traditional	6	341	56	192	70	64	80	51	43	47	17
	7	334	114	44	189	67	141	38	125	19	92
	10	329	99	190	134	50	158	30	139	23	97
	82	320	65	184	91	68	92	48	83	44	47
	95	293	47	168	63	54	66	34	59	20	40
	65	242	64	142	79	59	76	35	70	33	38
Bad	4	810	82	475	75	206	90	178	84	5	160
	15	357	28	196	35	96	20	75	7	65	1
Std Dev		125	39	116	55	38	61	36	56	21	48
Mean		434	92	266	120	89	124	67	107	43	78
Median		417	100	264	133	83	138	60	118	45	82
Max		648	165	475	225	206	240	178	216	75	181
Min		242	28	44	35	50	20	30	7	5	1

The trend presented here is similar to the trend seen in the damping comparisons table. This is due to the relationship between damping and amplitude. Since blanks with lower damping will generally respond with higher amplitude, it makes sense that higher-quality blanks will have greater responses. As mentioned before, blank 4 appears to be an outlier, suggesting additional criteria are needed to properly identify the musical quality of a blank. The "bad" blank that was present in the damping and frequency comparisons tables was left out in Table 4-5, because the amplitudes grossly skewed the conditional formatting, offering little insight to trend identification.

An amplitude ratio comparison table was also generated and is shown in Table 4-6. This is similar to the damping and frequency ratio comparison tables in sections 4.1 and 4.2.

Table 4-6: PSMIF amplitude ratios of marimba blanks.

Quality Tier	Sample #	Amplitude Ratios: 1st Bending vs. 1st Torsion	1st Bending vs. 2nd Bending	1st Bending vs. 2nd Torsion	1st Bending vs. 3rd Bending	1st Torsion vs. 2nd Bending	1st Torsion vs. 2nd Torsion	1st Torsion vs. 3rd Bending
Premium	3	0.21	0.68	0.30	0.20	3.25	1.41	0.94
	12	0.21	0.82	0.27	0.26	3.90	1.31	1.22
	38	0.21	0.60	0.29	0.17	2.84	1.39	0.81
	88	0.27	0.61	0.37	0.16	2.28	1.38	0.60
Enhanced	18	0.08	0.58	0.11	0.17	7.40	1.37	2.13
	23	0.32	0.67	0.43	0.17	2.13	1.36	0.54
	40	0.25	0.58	0.32	0.16	2.33	1.30	0.66
	79	0.25	0.66	0.33	0.20	2.62	1.32	0.78
Traditional	6	0.16	0.56	0.21	0.19	3.43	1.25	1.14
	7	0.34	0.13	0.42	0.20	0.39	1.22	0.59
	10	0.30	0.58	0.41	0.15	1.92	1.36	0.51
	52	0.20	0.58	0.28	0.21	2.83	1.40	1.05
	95	0.16	0.57	0.21	0.19	3.58	1.34	1.16
	65	0.27	0.59	0.33	0.24	2.21	1.23	0.91
Bad	4	0.13	0.78	0.12	0.34	5.79	0.91	2.51
	15	0.08	0.55	0.10	0.27	6.90	1.22	3.38
Std Dev		0.08	0.15	0.11	0.05	1.87	0.12	0.81
Mean		0.21	0.60	0.28	0.20	3.36	1.30	1.18
Median		0.21	0.58	0.29	0.19	2.84	1.33	0.93
Max		0.34	0.82	0.43	0.34	7.40	1.41	3.38
Min		0.08	0.13	0.10	0.15	0.39	0.91	0.51

The PSMIF magnitude ratios seem to have little to no correlation with the quality of a blank. There is some trending, such as first torsion vs second torsion, but these are occasionally broken (i.e., blank 52). Also, although blanks 18 and 15 share similar first bending vs first and second torsion ratios, their qualities are significantly different. A number of other conflicting values make using magnitudes as a comparison tool by itself inconsistent and unreliable.

4.4. Modal Assurance Criteria

One of the most useful tools for comparing mode shapes is the modal assurance criteria (MAC). This approach is typically used to confirm that all primary (target) modes of interest are independent as directly measured. This is a necessary step for modal surveys on satellites and aircraft, where test article geometry can be complex and mode shape coupling can occur.

The MAC is a scalar value between zero and one, representing the correlation between two mode shapes. High correlation is indicated by a value near one. The MAC value between two mode shapes is computed using the following vector inner products.

$$MAC_{12} = \frac{\left|\{\Phi_1\}^H \{\Phi_2\}\right|^2}{\{\Phi_1\}^H \{\Phi_1\}\{\Phi_2\}^H \{\Phi_2\}} \qquad \text{Equation 4-1}$$

The vectors Φ_1 and Φ_2 are the mode shapes being compared and the $\{.\}^H$ notation indicates the conjugate transpose.

The resulting matrix of values for marimba blank 3 can be seen in Figure 4-1.

	1st Bending	1st Torsion	2nd Bending	2nd Torsion	3rd Bending	3rd Torsion	4th Bending	4th Torsion	5th Bending	6th Bending
1st Bending	1.00			0.01	1.00				0.07	
1st Torsion		1.00				1.00			0.03	1.00
2nd Bending			1.00				1.00			
2nd Torsion	0.01			1.00				1.00		
3rd Bending	1.00				1.00				0.06	
3rd Torsion		1.00				1.00			0.03	1.00
4th Bending			1.00				1.00			
4th Torsion				1.00				1.00		
5th Bending	0.07	0.03			0.06	0.03			1.00	0.01
6th Bending		1.00				1.00			0.01	1.00

Figure 4-1: Self-MAC for marimba blank 3.

The MAC presented here is a self-MAC. In other words, the mode shapes of blank 3 are compared against themselves. This is a good method for determining whether the modes of a structure are easily distinguishable. Under normal circumstances in which a MAC is typically used, the center diagonal of ones that extends from the top left corner to the bottom right corner would be the only cells in the grid that have values close to one. An ideal MAC has values of exactly one along this diagonal and zeros everywhere else, indicating that every mode can be uniquely identified from the data with full confidence. However, because MACs were not originally anticipated to be part of this test effort, the number of measurement points necessary to distinguish the mode shapes was not recorded. Because of the geometric simplicity of the marimba blank, it is very easy to distinguish the mode shapes from FRF alone.

The additional diagonals of ones represent mode shapes that correlate well with others. For example, first bending has a correlation of one when compared with third bending. The MAC essentially "thinks" that these two mode shapes are identical because the measurement locations are seeing the same response for both modes. The engineer and tuner know they are different, because the third bending mode shape resonates at a much higher frequency. To clarify this point, Figure 4-2 illustrates the response of the measurement points for both modes.

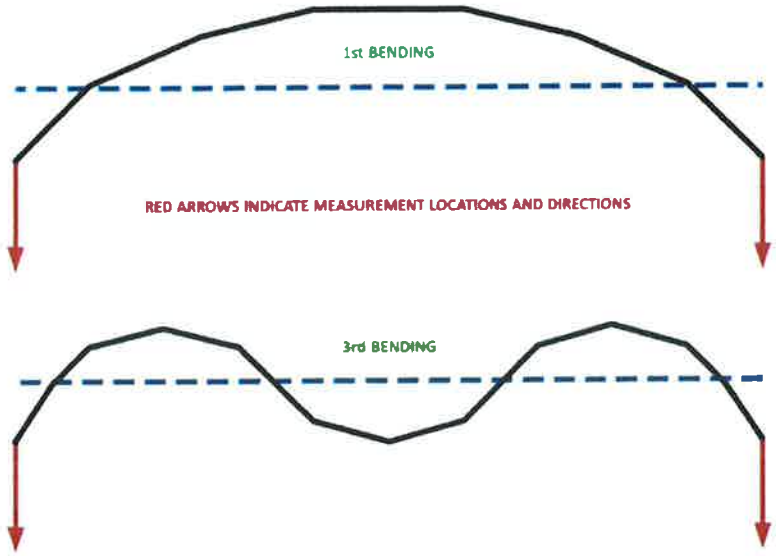


Figure 4-2: Mode shape measurement comparison
(first bending and third bending).

Since the responses for both modes in phase with equal amplitudes, the MAC calculation gives a near-unity result, suggesting that these modes are identical. Obviously they are not, but the comparison is still useful in that we can see how symmetric the bending modes are in relation to others. Blank 3 shows very good symmetry, suggesting that uniformity and/or some level of symmetry in the material is required to obtain good musical qualities.

When looking at the higher mode shapes, variances in the wood start to affect the results. A good example of this can be seen in blank 3 when comparing first bending with fifth bending. The result is 0.97. This is most likely due to the predrilled bar cord holes. For higher-frequency modes, the absence of this material starts to have an effect on the symmetry of the shape, resulting in the slightly lower value we see here.

The self-MAC matrix is useful when determining how distinguishable the mode shapes are with the given measurements. However, since we now have a reference for what a premium quality blank's MAC should look like, one can compare blank 3's mode shapes against other blanks, creating what is called a cross-MAC table. A cross-MAC table between blank 3 and blank 88 is presented in Figure 4-3.

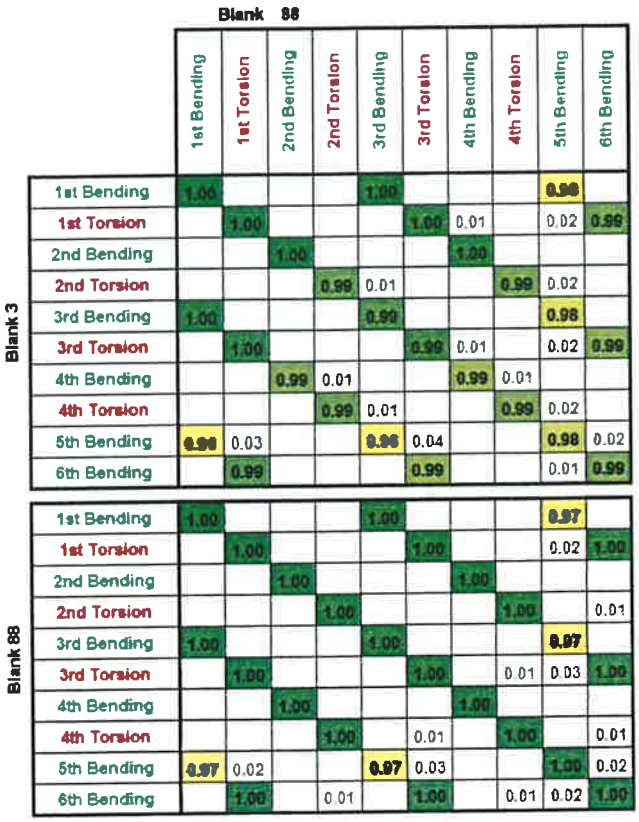


Figure 4-3: Cross-MAC between marimba blanks 3 and 88.

The cross-MAC is presented in the top half of the figure and is a summary of how well the modes of blank 88 compare to the modes of blank 3. Also included in the figure is the self-MAC for blank 88 (bottom half). Note that blank 88 matches up well with blank 3, and that blank 88's self-MAC looks nearly as good as blank 3's self-MAC (previously shown in Figure 4-1). Both blanks were ranked in the "premium" tier. Since blank 3 was graded so highly and because its self-MAC produced the best numbers, it was used as a reference to generate cross-MAC comparisons for all other blanks. All MACs can be found in Appendix D. The importance of the MACs on marimba blank quality is discussed further in section 6.3.

5. ALTERNATIVE MATERIALS STUDY

Following completion of ATA's modal test program, a selection of test blanks were sent to Carnegie Mellon University (CMU) where a thorough material study was performed by a group of students for their capstone project. Literary research led the students to study the material density, flexural modulus, and loss coefficient (damping) of the test blanks; according to literature, these material properties are strongly correlated to sound quality. The microstructure of the rosewood was also observed. Two test blanks from each of the four sound quality tiers were tested (3, 4, 6, 7, 12, 15, 18, and 23). After characterizing the material properties of the test blanks, promising synthetic replacement materials were identified.

This section provides an overview of CMU's work. For a more thorough discussion of their work and recommendations, see the final report found in Appendix E.

5.1. Density

Material density is linked to a material's sound radiation coefficient, or its ability to resonate sound. The higher the density, the lower the sound radiation coefficient and the longer the period of time the material is able to resonate. For this reason, CMU identified the densities of the rosewood test blanks.

The density of each test blank was measured at three locations to analyze the standard deviation of a single test blank. Figure 5-1 shows the resulting densities, including error bars for the standard deviation among the three test locations. The average density of the rosewood was found to be 0.97 g/cm^3, which is greater than most hardwoods and is consistent with published values. However, no correlation between density and rated sound quality was observed. This means that while material density plays a role in the characteristic timbre of Honduran rosewood, it is not the driving factor in sound quality.

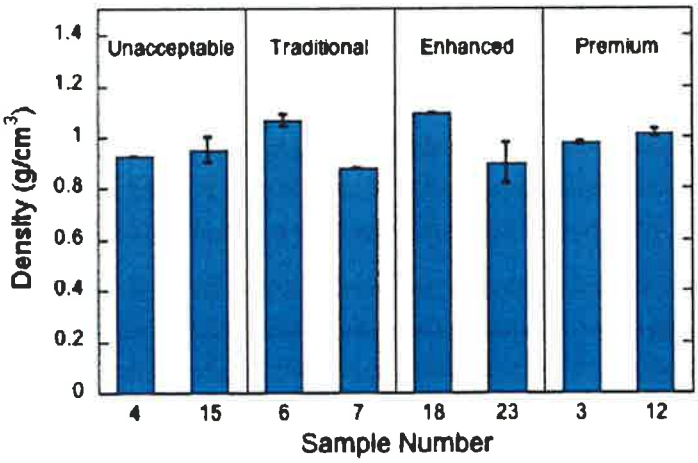


Figure 5-1: Measurements of Honduran rosewood density. Error bars indicate the standard deviation among multiple tests from the same test blank.

5.2. Flexural Modulus

Because of the anisotropic structure of wood, the flexural modulus can vary greatly from blank to blank depending on the orientation of the wood grain. The flexural modulus was therefore tested by CMU to determine if a correlation exists between sound quality tiers and flexural modulus.

The flexural modulus of each test blank was measured at two to three locations to analyze the standard deviation among a single test blank. Figure 5-2 shows the resulting flexural moduli, including error bars for the standard deviation among the test locations. The average flexural modulus of the rosewood was found to be 7.5 GPa, which is significantly lower than published values, possibly due to different test methods. Regardless, little correlation between flexural modulus and sound quality tiers was observed.

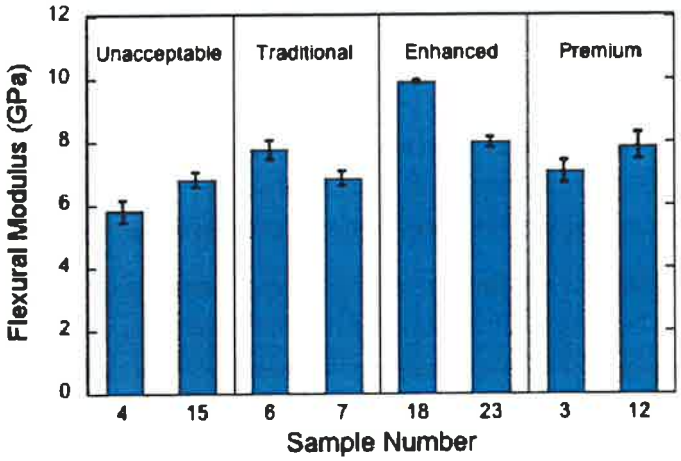


Figure 5-2: Measurements of Honduran rosewood flexural moduli. Error bars indicate the standard deviation among multiple tests from the same test blank.

5.3. Loss Coefficient

At resonance, energy is lost during a hysteresis loop due to microscale processes, which affects a material's ability to resonate sound. Material damping can be quantified in terms of the loss coefficient, or the fraction of energy lost in a single stress cycle. Materials with low damping (or loss coefficient) are better resonators since the duration of the vibration is longer than that of a material with high damping.

CMU tested each of the test blanks using dynamic mechanical analysis (DMA) in the frequency range of 40–100 Hz. Higher frequencies could not be tested due to equipment limitations. The loss coefficient of each test blank was measured at three locations to analyze the standard deviation of a single test blank. Figure 5-3 shows the resulting average loss coefficient among the different sound quality tiers. A strong correlation between lower loss coefficient and improved sound quality was observed near 90 Hz. There is some degree of correlation near 70 Hz as well, though the traditional curve is misbehaved due to two anomalous test samples in the traditional quality test blanks.

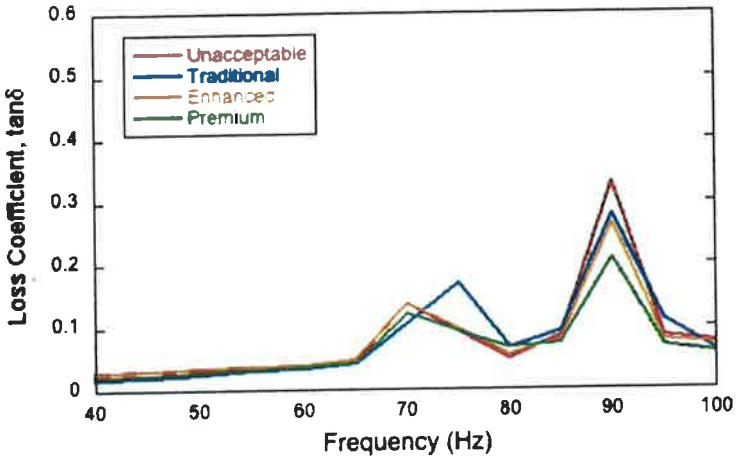


Figure 5-3: Average loss coefficient as a function of using six samples from each sound quality tier.

5.4. Material Microstructure

Environmental scanning electron microscopy (e-SEM) was performed on four samples of the marimba blank rosewood corresponding to the four different levels of quality (bad or unacceptable, traditional, enhanced, and premium). The preparation technique of all imaged surfaces had the same orientation with respect to the wood grain, in which the ribbons of cells running perpendicular to the grain were parallel to the fracture surface. This results in a structure where the primary grain is crosshatched with perpendicular bundles of cells, as shown in Figure 5-4(b). A different sample preparation technique, which splits the wood orthogonal to the rays, shows the rays in cross section as lenticular groups of organized pores, as in Figure 5-4(c). This structure is typical of hardwoods, as shown in Figure 5-4(a), and notable only for the fine grain and low porosity expected from a high-density hardwood.

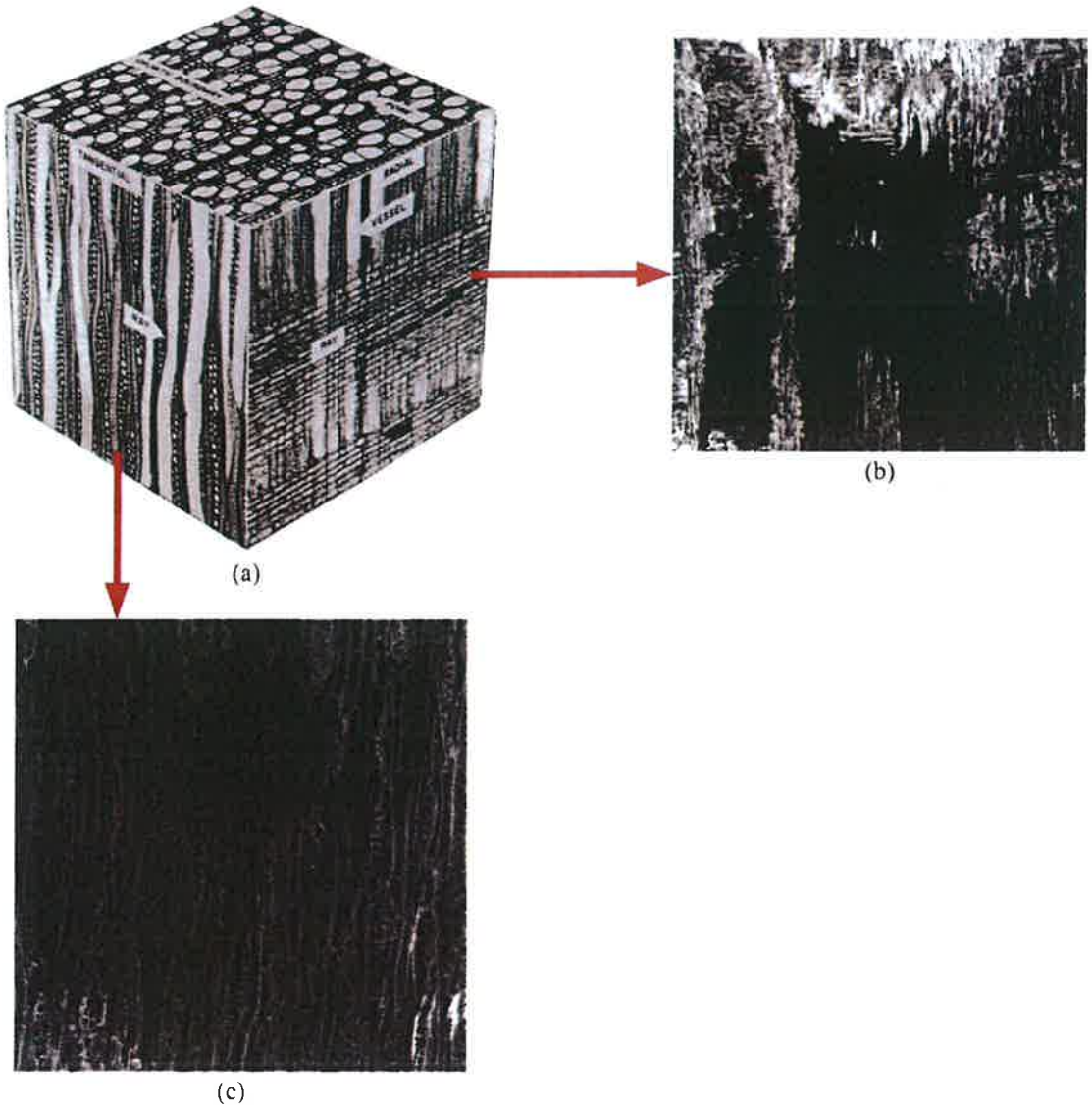


Figure 5-4: General features of Honduran rosewood microstructure samples.
(a) Schematic of hardwood microstructure.
(b) Typical fracture surface in this study (blank 12).
(c) Fracture surface perpendicular to rays, showing lenticular pore structure (scrap sample).

Figure 5-5 shows e-SEM photographs of four different samples, each from a different quality category. CMU results show that there is no definitive structural difference between samples of different quality levels. All show the same fine, well-organized grain and ray structure. Variations in the "smoothness" of the fracture surfaces are artifacts of the preparation method. These results suggest that variations between samples occur at larger length scales.

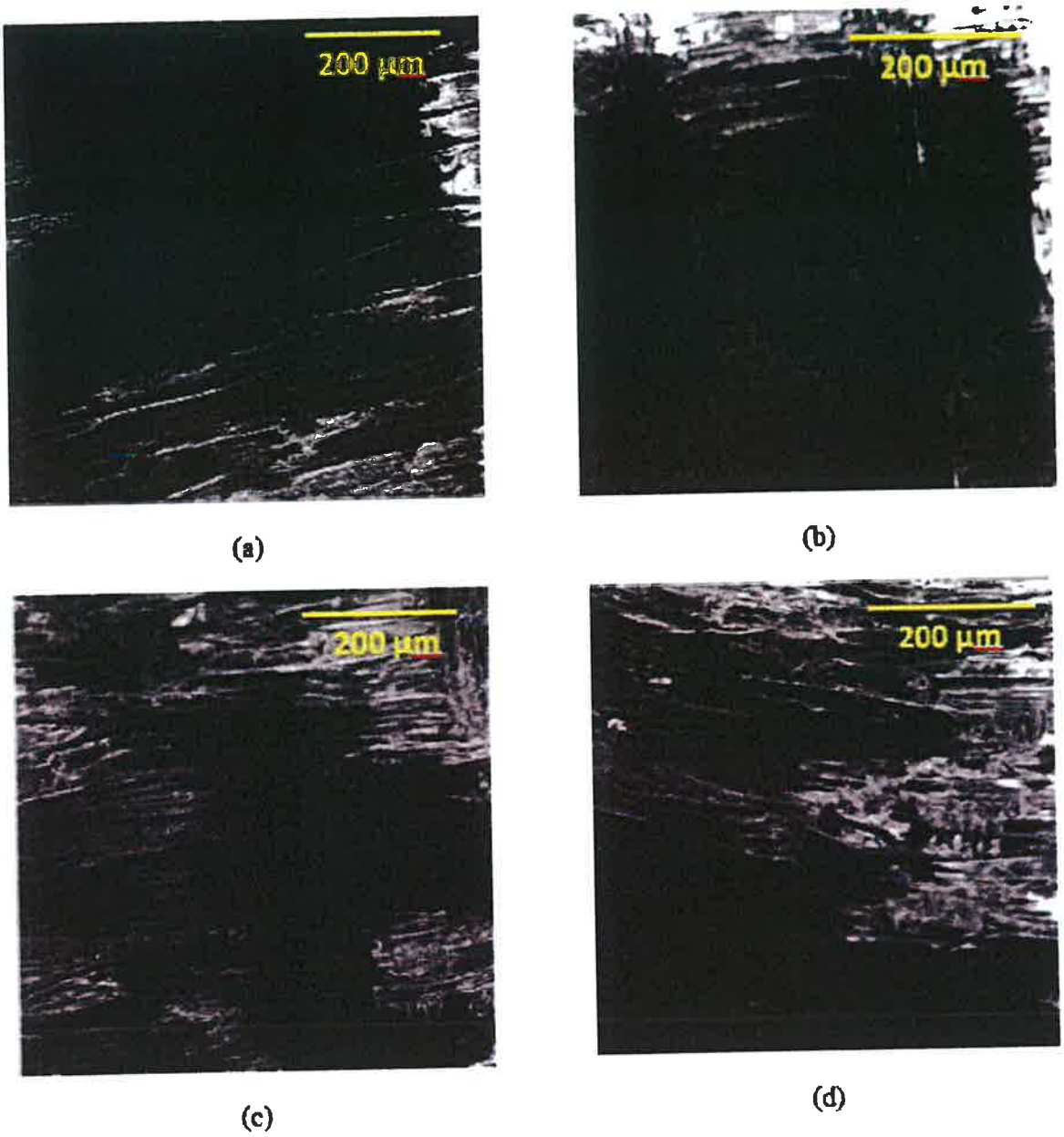


Figure 5-5: Microstructure of Honduran rosewood samples by quality: (a) sample 3, premium, (b) sample 18, enhanced, (2) sample 6, traditional, and (d) sample 15, unacceptable (bad).

5.5. Alternative Materials Study

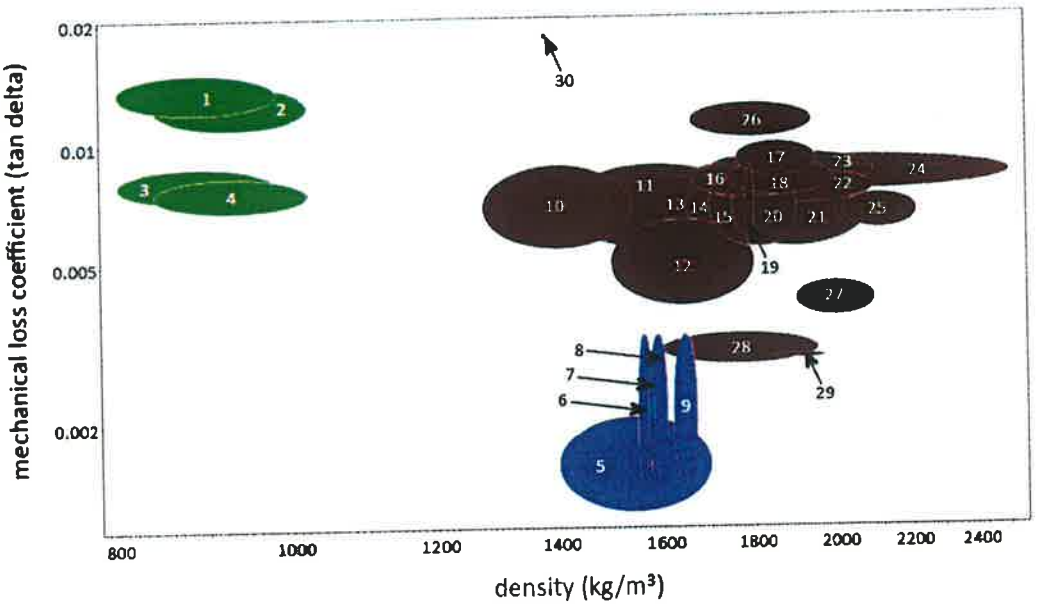
Following their material testing program of the Honduran rosewood test blanks, CMU compiled a list of selection criteria for alternative materials. Criteria such as manufacturability, cost, aesthetics, durability, and sustainability were evaluated, along with material properties.

It was concluded that the most suitable alternative material must possess material properties comparable to Honduran rosewood, specifically density and flexural modulus. Significant changes to these properties would require musicians to retrain their muscle memory to accommodate a different musical feel,

possibly requiring the use of a different style mallet. Perhaps the most important requirement, however, is a loss coefficient that is consistently less than or equal to that of the premium Honduran rosewood test blanks.

Since experts agree that lightly damped metals and/or ceramics are not suitable alternative materials because they produce sound qualities that are qualitatively different from Honduran rosewood, the alternative material must also contain a polymeric, anisotropic structure. The most straightforward material group to achieve these requirements is synthetic fiber-reinforced composites. The flexural modulus of these composites can be controlled by fiber fraction and alignment, making density and loss coefficient the material properties of greatest interest.

Using a commercial materials database (GRANTA's CES Selector), CMU identified three material types that could possibly replace Honduran rosewood for use in marimba bars—carbon fiber composites, glass fiber composites, and aramid fiber composites. Figure 5-6 shows how the density and loss coefficient of these materials compare to the Honduran rosewood. A variety of fiber and matrix compositions, fiber fractions, fiber alignments, and material processing techniques are included in this chart.



Key to Materials Systems

Woods
1 Rosewood (dalbergia nigra) transverse
2 Rosewood (dalbergia latifolia) transverse
3 Rosewood (dalbergia nigra) longitudinal
4 Rosewood (dalbergia latifolia) longitudinal

Carbon fiber composites
5 Epoxy SMC (carbon fiber)
6 PEEK/IM carbon fiber, UD composite, 0° lamina
7 Epoxy/HS carbon fiber, UD composite, 0° lamina
8 BMI/HS carbon fiber, UD composite, 0° lamina
9 Cyanate ester/HM carbon fiber, UD composite, 0° lamina

Glass fiber composites
10 Polyester SMC (30% glass fibre, slow burning, low density)
11 Polyester SMC (25% glass fibre, slow burning)
12 Epoxy SMC (glass fiber)
13 Polyester SMC (25% glass fiber, self-extinguishing)
14 Polyester SMC (30% glass fiber, self-extinguishing)
15 Polyester SMC (15% glass fiber, self-extinguishing)
16 Polyester/E-glass fiber, pultruded composite (UD fiber & CSM), 0° direction
17 Polyester BMC (20-30% glass fiber)
18 Polyester BMC (7-10% glass fiber)
19 Polyester SMC (20% glass fiber, slow burning)
20 Polyester SMC (40% glass fiber, self-extinguishing)
21 Polyester SMC (30% glass fiber, self-extinguishing, low resistivity), Polyester SMC (50% glass fiber, self-extinguishing)
22 Polyester (glass fiber, preformed, chopped roving)
23 Polyester (glass fiber, preformed, chopped glass)
24 Polyester BMC (10-20% glass fiber)
25 Polyester/E-glass fiber, filament wound composite, ±60° laminate
26 Polyester/E-glass fiber, pultruded composite (UD fiber & CSM), 90° direction
27 Polyester/E-glass fiber, pultruded composite rod, unidirectional laminate
28 Glass/epoxy unidirectional composite
29 Epoxy/S-glass fiber, UD composite, 0° lamina

Aramid fiber composite
30 Epoxy/aramid fiber, UD composite, 0° lamina

Acronyms

BMC=bulk molding composite
BMI=bis-maleimide
CSM=chopped strand mat
HM=high modulus
HS=high strength
IM=infusion molded
PEEK=polyether ether ketone
SMC=sheet molding composite
UD=unidirectional

Figure 5-6: Material selection map for polymer composite systems comparing loss coefficient and density.

All three material types possess material densities roughly 1.25–3.13 times greater than that of Honduran rosewood, with comparable or reduced loss coefficients. Aramid fiber composites were dismissed completely as an alternative material, however, since they have a slightly higher loss coefficient and material cost. The loss coefficients of carbon fiber and glass fiber composites are less than or equal to that of Honduran rosewood, making them suitable alternative materials. Summary tables showing the benefits and drawbacks of these materials are shown in Table 5-1 and Table 5-2.

Table 5-1: Carbon fiber composite report card.

Carbon fiber composites		
Consideration	**Suitability**	**Notes**
Loss coefficient	?	Loss coefficient lower than rosewood may or may not improve sound quality; further investigation is merited.
Anisotropy	✔	Can be precisely tailored through processing.
Density	–	Generally higher than rosewood.
Modulus	✔	Can be adjusted to the desired value by varying the fiber fraction according to the rule of mixtures.
Manufacturability	–	Can be obtained as bar stock and may be shaped using woodworking tools; however, fine dust production requires mitigation.[15]
Cost	?	Widely available; cost profile higher than glass fiber composites. Analysis needed to compare to rosewood.
Aesthetics	✚	Opportunities for novel "high tech" finish. Can be coated.
Durability	✚	Significantly more durable than wood: Tough, water resistant and stable with respect to changes in ambient humidity and temperature.
Sustainability	✚	Readily available with no supply chain issues.
✔ = meets rosewood standards		✚ = improves upon rosewood
– = some deficits compared to rosewood		? = requires further investigation

Table 5-2: Glass fiber composites report card.

Glass fiber composites		
Consideration	**Suitability**	**Notes**
Loss coefficient	✔	Loss coefficient similar to rosewood over a variety of compositions, structures, and processing routes.
Anisotropy	✔	Can be precisely tailored through processing.
Density	–	Generally higher than rosewood.
Modulus	✔	Can be adjusted to the desired value by varying the fiber fraction according to the rule of mixtures.
Manufacturability	–	Can be obtained as bar stock and may be shaped using woodworking tools; however, because silica glass particles are an inhalation hazard, additional particulate control systems may be required.[15]
Cost	✚	Widely available, with a cost profile that is easily competitive with imported hardwood.
Aesthetics	?	Can be colored or coated. Not a convincing wood simulant.
Durability	✚	Significantly more durable than wood: Tough, water resistant and stable with respect to changes in ambient humidity and temperature.
Sustainability	✚	Readily available with no supply chain issues.
✔ = meets rosewood standards		✚ = improves upon rosewood
– = some deficits compared to rosewood		? = requires further investigation

Despite the increased density and the need for dust (or glass silica) mitigation during manufacturing, carbon fiber and glass fiber composites may be suitable replacement materials for Honduran rosewood for use in musical instruments. CMU recommends additional sound quality testing and material design efforts to better match the anisotropy, density, and modulus of Honduran rosewood before the transition could be made. Density could be tailored using air-filled micro-balloons in the polymer matrix, although this, as well as using different fiber arrangements, could affect sound quality.

6. CONCLUSIONS AND RECOMMENDATIONS

Modal testing and materials study of Honduran rosewood marimba blanks was successfully completed, offering significant insight to the problem of understanding what structural properties of rosewood directly influence the final musical quality of the resulting tuned marimba bars. This is a crucial step in the process of identifying or developing a synthetic replacement of equal musical quality.

6.1. Final Tuning of Tested Marimba Blanks

After modal testing was completed, the marimba blanks were sent off to be tuned and their initial quality assessment refined, if needed. As a result of the tuning process, five blanks shifted in quality. Blank 12, originally placed in the "premium" tier, could not be tuned to meet even the "traditional" quality. It was therefore sorted into the "bad" tier. Blank 65 fell into the "bad" tier as well, though this was expected since the damping values more closely matched blank 15, which also remained in the "bad" tier. Blank 38 was unable to remain in the "premium" tier by the end of the tuning process, but it did retain some good qualities and was placed into the "enhanced" tier. Blank 52 was actually upgraded to "enhanced" even though its overall damping qualities did not fall in line with other blanks in the same tier. And blank 18 was downgraded to "traditional," which could have been in part due to some asymmetry seen in the cross-MAC table with blank 3. Blank 10 ended up on the border between "traditional" and "enhanced," and no official decision was made by the time this report was written. Additional discussion regarding blanks 12 and 52 is presented in section 6.4.

Since some of the blanks' quality ratings were changed, previously generated tables were also updated. Table 6-1 through Table 6-3 show the re-sorted frequency, damping, and PSMIF amplitude comparisons originally presented in section 4. Note that a letter designation next to the number represents the first letter of the tier to which it originally belonged. For instance, a "P" accompanies blank 12 to indicate that it was originally categorized into the "premium" tier.

Table 6-1: Resorted modal frequency comparisons between marimba blanks.

Quality Tier	Sample #	Modal Frequencies (Hz)													
		1st Bending	1st Torsion	1st Lateral Bending	2nd Bending	2nd Torsion	3rd Bending	2nd Lateral Bending	3rd Torsion	4th Bending	4th Torsion	3rd Lateral Bending	5th Bending	1st Axial	6th Bending
Prem	3	406	768	1032	1076	1577	2004	2288	2447	3113	3412	3642	4329	4418	4481
Prem	88	407	740	1033	1083	1517	2065	2267	2374	3109	3311	3573	4288	4442	4384
Enhanced	P 38	419	772	1068	1105	1580	2043	2341	2459	3154	3425	3707	4361	4567	4491
Enhanced	23	384	801	999	1019	1634	1903	2256	2520	2973	3484	3652	4154	4177	4542
Enhanced	40	406	808	1056	1072	1644	1988	2372	2527	3075	3498	3802	4252	4426	4554
Enhanced	79	416	800	1059	1096	1624	2021	2381	2512	3109	3480	3777	4291	4543	4525
Enhanced	T 52	416	771	1074	1099	1572	2030	2358	2448	3118	3408	3742	4281	4569	4460
Traditional	10	416	767	1036	1096	1569	2023	2289	2427	3115	3388	3844	4287	4551	4414
Traditional	E 18	418	787	1073	1100	1620	2022	2387	2497	3105	3460	3808	4276	4571	4502
Traditional	7	391	801	1023	1024	1624	1920	2311	2502	2983	3446	3728	4150	4279	4485
Traditional	6	431	781	1108	1128	1592	2058	2408	2471	3151	3440	3788	4297	4710	4512
Traditional	95	379	771	982	1012	1584	1883	2215	2445	2937	3384	3567	4062	4120	4425
Bad	P 12	397	812	1023	1050	1645	1950	2317	2536	3021	3502	3738	4196	4325	4555
Bad	4	375	798	959	1003	1632	1884	2201	2514	2936	3481	3602	4035	4033	4145
Bad	T 65	419	786	1078	1097	1604	2012	2386	2475	3082	3414	3805	4215	4591	4447
Bad	15	439	771	1110	1150	1588	2073	2400	2455	3108	3446	3746	4208	4855	4534
	Std Dev	18	20	42	43	35	61	65	43	73	50	84	89	219	101
	Mean	408	784	1044	1076	1599	1989	2322	2476	3088	3436	3708	4231	4448	4465
	Median	412	783	1046	1089	1598	2009	2329	2473	3104	3443	3733	4264	4492	4488
	Max	439	812	1110	1150	1645	2073	2408	2536	3154	3502	3809	4361	4855	4555
	Min	375	740	959	1003	1517	1883	2201	2374	2937	3311	3567	4035	4033	4145

Quality Tier	Sample #	Frequency Ratio: 1st Bending vs...					1st Torsion vs...				1st Axial vs. 2nd Bending
		1st Torsion	2nd Bending	2nd Torsion	1st Axial	3rd Bending	2nd Bending	2nd Torsion	3rd Bending	1st Axial	
Prem	3	1.80	2.65	3.88	10.87	4.93	1.40	2.05	2.61	5.75	4.11
Prem	88	1.82	2.66	3.72	10.90	4.92	1.46	2.05	2.71	6.00	4.10
Enhanced	P 38	1.84	2.64	3.77	10.90	4.87	1.43	2.05	2.65	5.91	4.13
Enhanced	23	2.09	2.65	4.25	10.87	4.95	1.27	2.04	2.38	5.22	4.10
Enhanced	40	1.99	2.64	4.05	10.89	4.89	1.33	2.04	2.46	5.48	4.13
Enhanced	79	1.92	2.63	3.90	10.91	4.86	1.37	2.03	2.53	5.68	4.14
Enhanced	T 52	1.86	2.64	3.78	10.99	4.88	1.43	2.04	2.63	5.92	4.16
Traditional	10	1.84	2.63	3.77	10.93	4.86	1.43	2.04	2.64	5.93	4.15
Traditional	E 18	1.91	2.63	3.88	10.94	4.84	1.38	2.03	2.54	5.73	4.15
Traditional	7	2.05	2.62	4.15	10.93	4.90	1.28	2.03	2.40	5.34	4.18
Traditional	6	1.81	2.61	3.69	10.97	4.77	1.44	2.04	2.63	6.03	4.18
Traditional	95	2.03	2.67	4.18	10.87	4.97	1.31	2.06	2.44	5.35	4.07
Bad	P 12	2.04	2.64	4.14	10.89	4.91	1.29	2.03	2.40	5.32	4.12
Bad	4	2.13	2.67	4.35	10.76	5.02	1.25	2.04	2.36	5.05	4.02
Bad	T 65	1.87	2.62	3.87	10.95	4.90	1.40	2.04	2.56	5.84	4.19
Bad	15	1.76	2.62	3.57	11.07	4.72	1.49	2.03	2.69	6.29	4.22
	Std Dev	0.11	0.02	0.23	0.07	0.08	0.07	0.01	0.12	0.35	0.05
	Mean	1.93	2.64	3.93	10.91	4.88	1.37	2.04	2.54	5.68	4.13
	Median	1.90	2.64	3.88	10.91	4.89	1.39	2.04	2.55	5.75	4.14
	Max	2.13	2.87	4.35	11.07	5.02	1.49	2.06	2.71	6.29	4.22
	Min	1.76	2.61	3.57	10.76	4.72	1.25	2.03	2.36	5.05	4.02

Table 6-2: Resorted modal damping comparisons between marimba blanks.

Quality Tier	Sample #	Damping %													
		1st Bending	1st Torsion	1st Lateral Bending	2nd Bending	2nd Torsion	3rd Bending	2nd Lateral Bending	3rd Torsion	4th Bending	4th Torsion	3rd Lateral Bending	5th Bending	1st Axial	6th Bending
Prem	3	0.16	0.39	0.23	0.20	0.36	0.32	0.29	0.37	0.33	0.39	0.34	0.34	0.21	0.43
Prem	88	0.18	0.39	0.23	0.22	0.37	0.33	0.30	0.38	0.35	0.42	0.36	0.36	0.25	0.45
Enhanced	P 38	0.17	0.40	0.22	0.19	0.36	0.31	0.27	0.36	0.32	0.39	0.33	0.33	0.18	0.44
Enhanced	23	0.19	0.38	0.22	0.20	0.36	0.33	0.27	0.37	0.34	0.41	0.33	0.30	0.23	0.45
Enhanced	40	0.18	0.41	0.24	0.22	0.38	0.36	0.28	0.39	0.36	0.44	0.35	0.37	0.23	0.48
Enhanced	79	0.20	0.41	0.24	0.22	0.38	0.35	0.30	0.39	0.36	0.43	0.37	0.38	0.27	0.38
Enhanced	T 52	0.23	0.46	0.28	0.27	0.43	0.39	0.35	0.43	0.42	0.48	0.40	0.43	0.26	0.51
Traditional	10	0.21	0.49	0.28	0.26	0.46	0.40	0.36	0.48	0.41	0.49	0.42	0.43	0.27	0.56
Traditional	E 18	0.19	0.43	0.25	0.22	0.40	0.36	0.30	0.40	0.37	0.44	0.36	0.39	0.20	0.49
Traditional	7	0.21	0.45	0.28	0.27	0.43	0.38	0.35	0.44	0.39	0.48	0.41	0.41	0.24	0.53
Traditional	6	0.22	0.46	0.29	0.28	0.43	0.41	0.34	0.44	0.42	0.47	0.39	0.48	0.27	0.50
Traditional	95	0.23	0.50	0.30	0.26	0.46	0.40	0.36	0.47	0.40	0.50	0.42	0.38	0.26	0.54
Bad	P 12	0.17	0.40	0.23	0.21	0.37	0.32	0.29	0.38	0.34	0.40	0.34	0.34	0.23	0.44
Bad	4	0.21	0.39	0.26	0.23	0.40	0.35	0.30	0.39	0.36	0.41	0.35	0.29	0.26	0.36
Bad	T 65	0.24	0.51	0.33	0.29	0.48	0.42	0.40	0.48	0.46	0.51	0.44	0.45	0.28	0.58
Bad	15	0.25	0.49	0.34	0.31	0.47	0.43	0.38	0.46	0.48	0.49	0.45	0.54	0.29	0.50
	Std Dev	0.03	0.05	0.04	0.04	0.04	0.04	0.04	0.04	0.05	0.04	0.04	0.06	0.03	0.06
	Mean	0.20	0.43	0.26	0.24	0.41	0.37	0.32	0.41	0.38	0.46	0.38	0.39	0.25	0.48
	Median	0.20	0.42	0.26	0.23	0.40	0.36	0.30	0.40	0.37	0.44	0.37	0.38	0.26	0.48
	Max	0.25	0.51	0.34	0.31	0.48	0.43	0.40	0.48	0.48	0.51	0.45	0.54	0.29	0.58
	Min	0.16	0.38	0.22	0.19	0.36	0.31	0.27	0.36	0.32	0.39	0.33	0.29	0.18	0.38

Quality Tier	Sample #	Damping % Ratio: 1st Bending vs...					1st Torsion vs...				1st Axial vs. 2nd Bending
		1st Torsion	2nd Bending	2nd Torsion	1st Axial	3rd Bending	2nd Bending	2nd Torsion	3rd Bending	1st Axial	
Prem	3	2.41	1.21	2.22	1.32	1.97	0.50	0.92	0.82	0.55	1.09
Prem	88	2.18	1.22	2.09	1.41	1.87	0.56	0.96	0.86	0.65	1.16
Enhanced	P 38	2.33	1.14	2.11	1.07	1.85	0.49	0.91	0.79	0.46	0.93
Enhanced	23	2.06	1.07	1.94	1.25	1.76	0.52	0.94	0.86	0.61	1.16
Enhanced	40	2.22	1.22	2.10	1.26	1.97	0.55	0.94	0.89	0.57	1.05
Enhanced	79	2.07	1.12	1.93	1.33	1.73	0.54	0.93	0.84	0.64	1.19
Enhanced	T 52	2.00	1.18	1.86	1.20	1.71	0.59	0.93	0.85	0.60	1.02
Traditional	10	2.30	1.22	2.15	1.28	1.87	0.53	0.93	0.81	0.55	1.05
Traditional	E 18	2.30	1.16	2.16	1.10	1.94	0.50	0.94	0.84	0.49	0.95
Traditional	7	2.20	1.29	2.10	1.17	1.86	0.59	0.95	0.85	0.53	0.91
Traditional	6	2.09	1.26	1.95	1.22	1.86	0.61	0.94	0.90	0.59	0.97
Traditional	95	2.18	1.14	2.03	1.24	1.72	0.52	0.93	0.79	0.57	1.09
Bad	P 12	2.36	1.23	2.23	1.36	1.92	0.52	0.94	0.81	0.59	1.11
Bad	4	1.82	1.10	1.87	1.30	1.65	0.61	1.03	0.91	0.72	1.19
Bad	T 65	2.11	1.22	1.99	1.16	1.73	0.58	0.94	0.82	0.55	0.95
Bad	15	1.99	1.23	1.89	1.17	1.74	0.62	0.95	0.88	0.59	0.95
	Std Dev	0.16	0.06	0.12	0.09	0.10	0.04	0.03	0.04	0.06	0.10
	Mean	2.16	1.19	2.04	1.24	1.82	0.55	0.94	0.84	0.58	1.05
	Median	2.18	1.21	2.06	1.24	1.86	0.54	0.94	0.84	0.57	1.04
	Max	2.41	1.29	2.23	1.41	1.97	0.62	1.03	0.91	0.72	1.19
	Min	1.82	1.07	1.86	1.07	1.65	0.49	0.91	0.79	0.46	0.91

Table 6-3: Resorted PSMIF amplitude comparisons between marimba blanks.

Quality Tier	Sample #	Amplitude (G/Lbf)/1000									Amplitude Ratios						
		1st Bending	1st Torsion	2nd Bending	2nd Torsion	3rd Bending	3rd Torsion	4th Bending	4th Torsion	5th Bending	6th Bending	1st Bending vs. 1st Torsion	1st Bending vs. 2nd Bending	1st Bending vs. 2nd Torsion	1st Bending vs. 3rd Bending	1st Torsion vs. 2nd Bending	1st Torsion vs. 2nd Torsion	1st Torsion vs. 3rd Bending
Prem	3	507	125	405	177	118	187	92	161	75	108	0.21	0.60	0.30	0.23	3.25	1.41	0.94
	38	417	111	252	153	67	152	45	137	33	84	0.27	0.61	0.37	0.16	2.28	1.38	0.60
	P 38	648	136	388	169	110	107	89	173	71	108	0.21	0.60	0.29	0.17	2.84	1.39	0.81
Enhanced	23	520	165	350	225	89	240	58	216	31	181	0.32	0.67	0.43	0.17	2.13	1.36	0.54
	49	517	129	300	168	85	178	72	144	53	101	0.25	0.58	0.32	0.16	2.33	1.30	0.66
	78	417	105	275	138	62	141	61	120	47	65	0.25	0.66	0.33	0.29	2.62	1.32	0.78
	T 52	320	65	164	91	66	92	48	83	44	47	0.20	0.56	0.28	0.21	2.83	1.40	1.05
Traditional	10	329	99	190	134	50	158	30	139	23	97	0.30	0.58	0.41	0.15	1.92	1.36	0.51
	14	520	41	301	66	67	58	66	47	45	34	0.08	0.50	0.11	0.17	7.40	1.37	2.13
	7	334	114	44	139	67	141	38	125	19	92	0.34	0.13	0.42	0.20	0.99	1.22	0.59
	8	341	56	192	76	64	60	51	43	47	17	0.16	0.56	0.21	0.19	3.43	1.25	1.14
	95	293	47	168	83	54	66	34	59	20	40	0.16	0.57	0.21	0.18	3.56	1.34	1.16
Bad	P 12	481	101	392	131	123	135	94	116	71	80	0.21	0.82	0.27	0.26	3.90	1.31	1.22
	4	810	82	476	76	206	90	178	84	5	150	0.10	0.78	0.12	0.34	5.79	0.91	2.51
	T 65	242	64	142	78	58	76	35	70	33	38	0.27	0.59	0.33	0.24	2.21	1.25	0.91
	15	357	28	196	35	96	20	75	7	65	1	0.08	0.55	0.10	0.27	6.90	1.22	3.38
Std Dev		125	39	116	55	38	61	36	56	21	48	0.08	0.15	0.11	0.05	1.87	0.12	0.81
Mean		434	92	266	120	89	124	67	107	43	78	0.21	0.60	0.28	0.20	3.36	1.30	1.16
Median		417	100	264	133	83	138	60	118	45	82	0.21	0.58	0.29	0.19	2.84	1.33	0.93
Max		648	165	475	225	206	240	178	216	75	181	0.34	0.82	0.43	0.34	7.40	1.41	3.38
Min		242	28	44	35	50	20	30	7	5	1	0.08	0.13	0.10	0.15	0.39	0.91	0.51

The final quality assessment of the tuned marimba bars presents even more interesting results and conclusions about the structural properties of the tested rosewood blanks.

6.2. Musically Insensitive Properties

Throughout the test effort on the marimba blanks and sample wood by both ATA and CMU, a number of properties were identified that do not have a direct correlation on the musical quality of the wood, at least within the bounds of the blanks tested.

CMU discovered that the microstructural organization, density variation, and flexural modulus have no conclusive relationship with the Honduran rosewood's musical quality. This conclusion considers only the range of values recorded for the samples tested, and there are no additional data that fall outside of the values measured.

ATA's test results regarding modal frequencies and relative amplitudes also indicated weak or non-existent correlation to musical quality. Though some trending was observed with modal amplitude comparisons, a few outlying data points created a case arguing against the reliability of those trends. It is ATA's determination that the variation in both these studies cannot be used to directly determine a blank's musical quality potential.

6.3. Musically Sensitive Properties

Damping and mode shape symmetry stand out as the most influential properties that can be used to measure rosewood blanks' musical quality level, and damping is a prerequisite before one considers mode shape symmetry. This property of the rosewood was also observed in CMU's study of the material's loss factors. Table 6-4 lists potential guidelines when determining minimum damping of the first mode only.

These damping ranges were consistent if other secondary properties, including mode shape symmetry, were also acceptable. Note that overlap occurs in damping values because other sound quality factors are being considered by the master tuner.

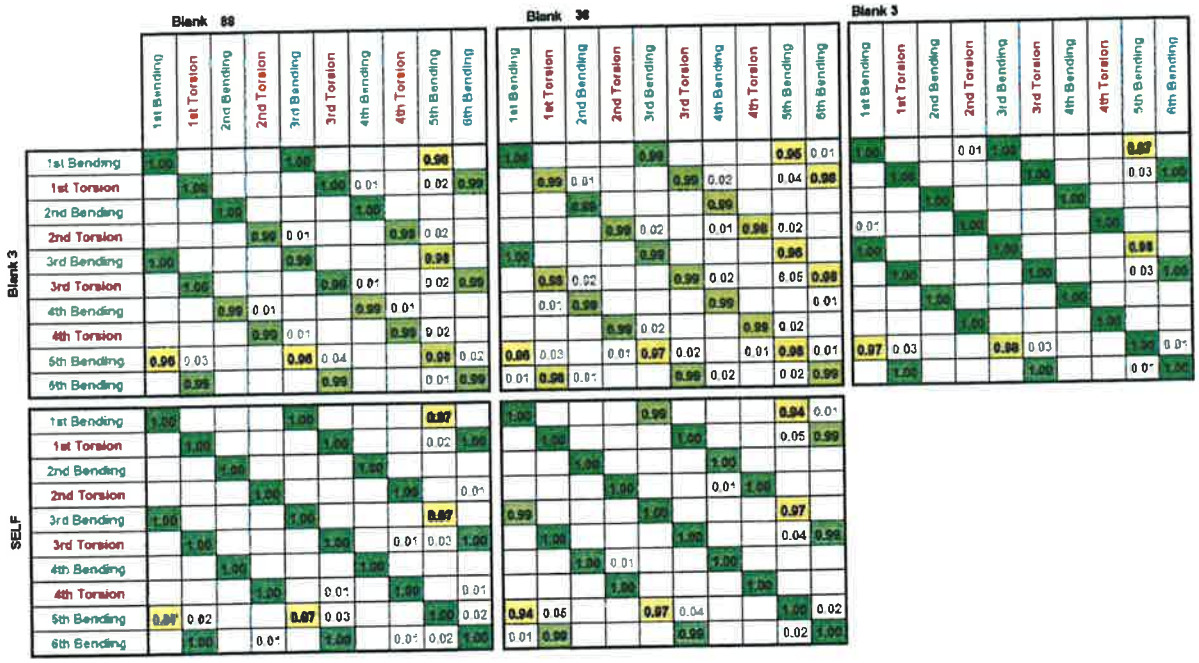
Table 6-4: Damping criteria as a quality prerequisite.

1st Bending Damping %	Quality Assessment			
	Premium	Enhanced	Traditional	Bad
<0.16				
0.16				
0.17				
0.18				
0.19				
0.2				
0.21				
0.22				
0.23				
0.24				
>0.25				

Other damping values to consider, however, include higher modes. This is demonstrated by blank 18, which offered good first bending damping values but also had higher damping values than its "enhanced" tier counterparts. In fact, when observing the original quality classifications, blank 18 was the highest damped blank of the "enhanced" tier, in a global sense (see Table 4-3). It is possible that the low damping of the first mode dominated the higher damping of other modes when making the initial quality assessment.

In addition to a prerequisite of damping coefficients for the marimba blanks, mode shape symmetry was found to provide quantitative insight into a blank's ultimate musical potential. Cross-MAC assessment can be used to determine whether mode shape symmetry is ideal for the process of tuning. As a demonstration, Table 6-5 presents the self-MACs and cross-MACs for blanks 38 and 88 vs blank 3. If we assume that blank 3 is an ideal candidate for comparison against other blanks (blank 3 was qualified by master tuners to have the highest musical quality of all samples in this study), then we can directly compare other blanks against it to determine how well matched the mode shape symmetries are.

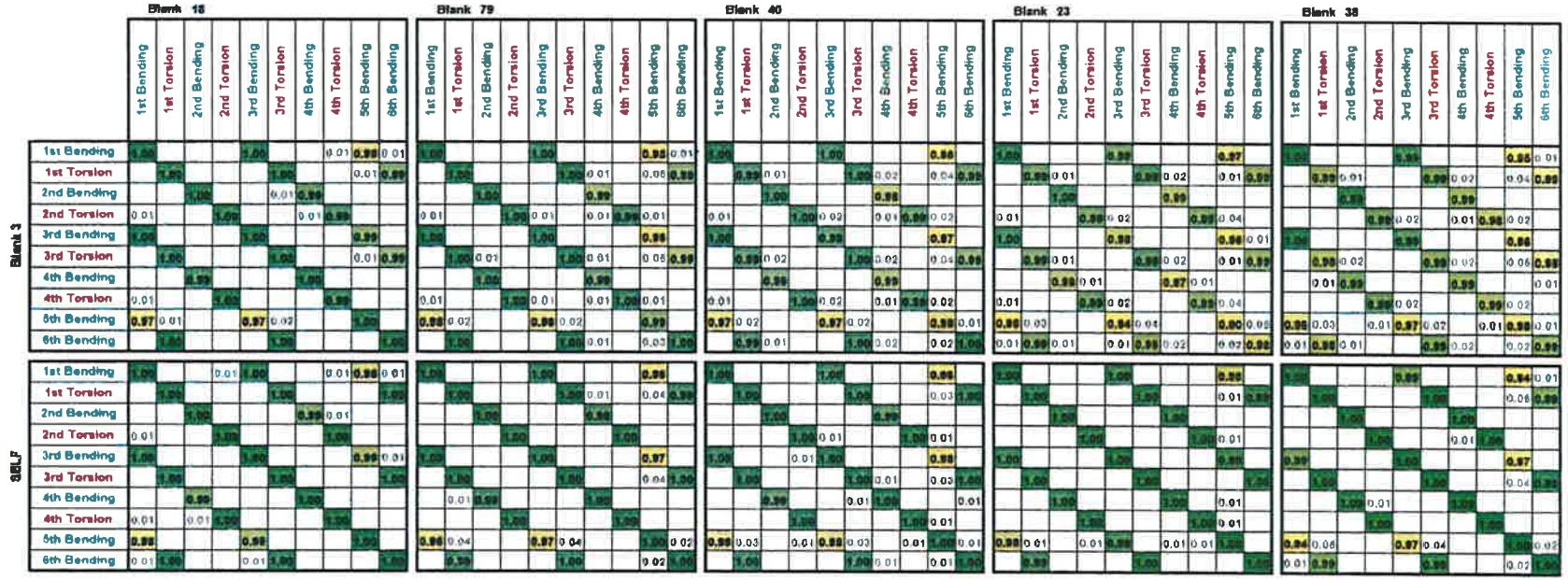
Table 6-5: Self-MAC and cross-MAC for blanks 3, 38, and 88.



Typically speaking, when values are close to one, the correlation is very good. Under typical modal test conditions (e.g., aircraft ground vibration tests), these results would be exceptional, excluding the off-diagonal correlations. However, the off-diagonal correlations were discussed in section 4.4 and concluded to be expected for this study. But for musical instruments, the human ear can perceive very fine variations in sound quality. It is therefore no surprise that even the slightest change in modal symmetry can have a noticeable impact on the listener's experience, and marimba instruments are no exception. Blank 38 was originally classified into the "premium" quality tier. The modal damping was ideal at 0.17% for the first bending mode, meeting the prerequisite shown previously in Table 6-4. However, the cross-MAC between blank 3 and blank 38 indicates that the mode shapes between the two blanks are slightly different. Note that blank 88 matches up better overall.

To support the argument that blank 38 did not belong in the "premium" tier initially, we can look at all of the "enhanced" tier cross-MACs in Table 6-6, including blank 38 for comparison. Though subtle, blank 38 does not demonstrate mode shape correlation like some others in this tier. Note that although blank 18 and 79 show promise as "premium" tier candidates, their first bending damping values of 0.19% and 0.20% put them both squarely in the "enhanced" tier initially.

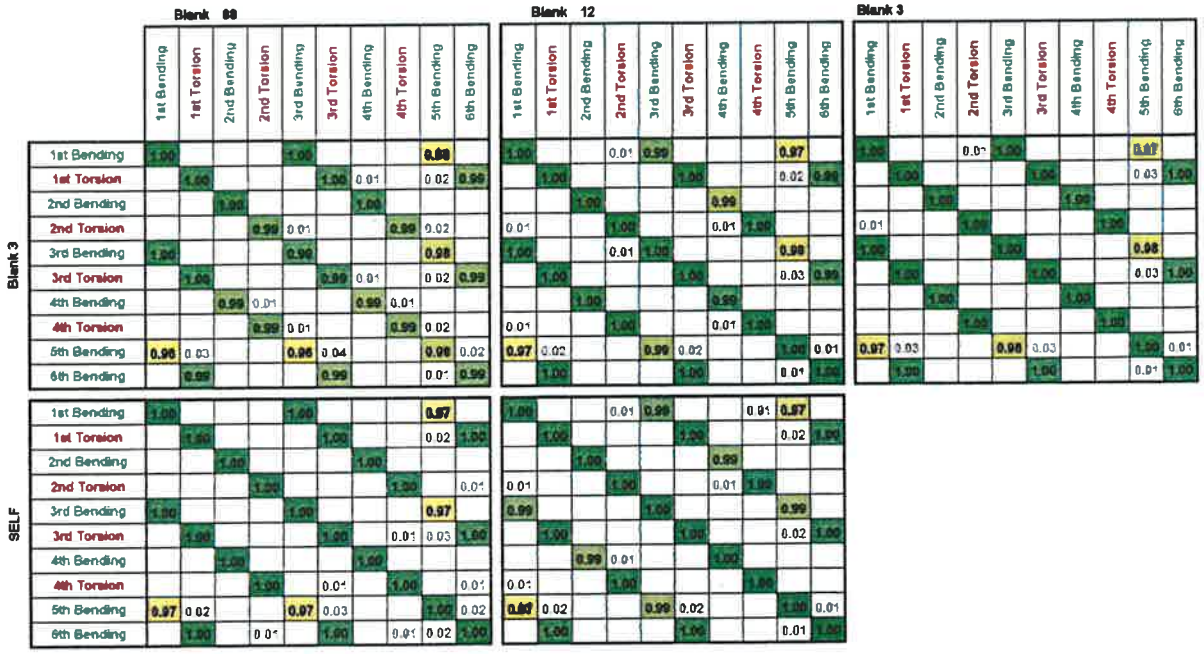
Table 6-6: Self-MAC and cross-MAC comparisons between blank 3 and all "enhanced" tier blanks (initial quality).



6.4. Considerations for Blanks 12 and 52

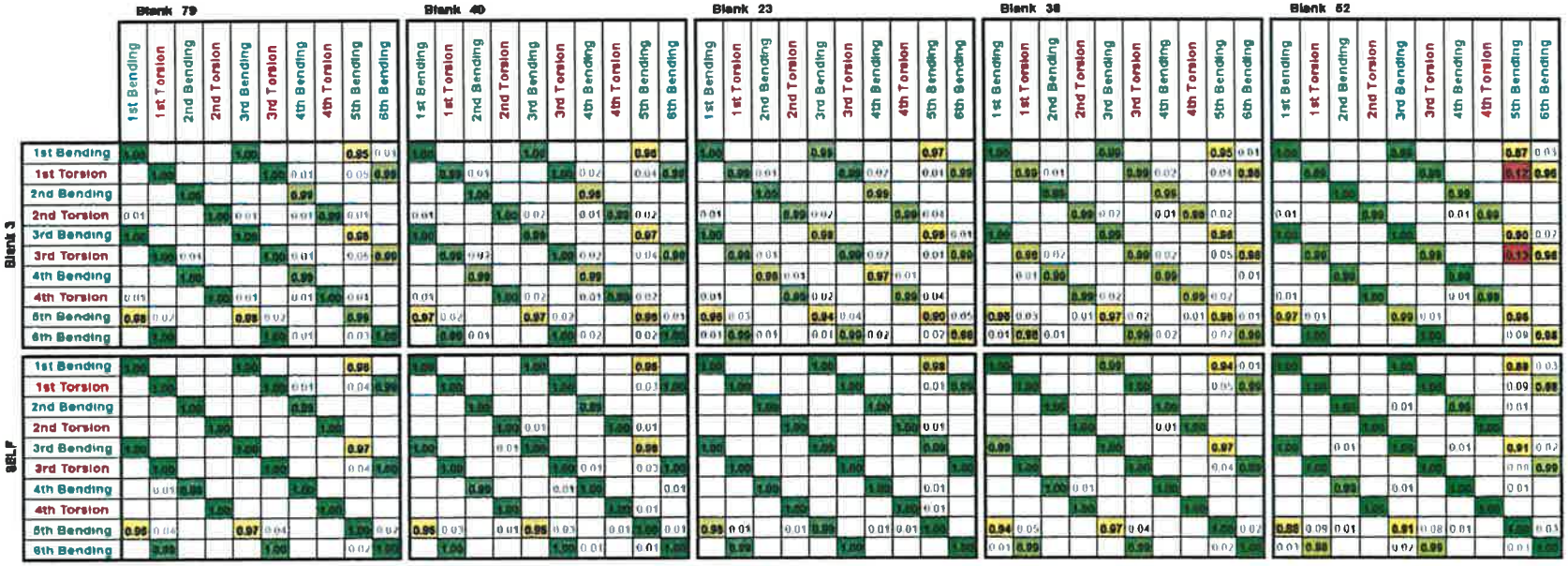
Blanks 12 and 52 are outliers in this study because they were ultimately cast into unexpected quality tiers from a quantitative sense. Blank 12 was ultimately classified as "bad," despite its exceptional demonstration of low damping and mode shape symmetry. At a value of 0.17% damping and a cross-MAC comparable to other "premium" tier blanks (see Table 6-7), the tuning process revealed unacceptable musical qualities. Master tuners will agree that this unpredictability is not an uncommon occurrence.

Table 6-7: Self-MACs and cross-MACs for premium tier blanks and blank 12.



Blank 52 was upgraded to "enhanced" status even though the overall damping of all relevant modes was noticeably higher than the other "enhanced" blanks in the original classification (see Table 4-3). Table 6-8 presents the "enhanced" tier cross-MACs, re-sorted to match their final qualities after tuning.

Table 6-8: Self-MACs and cross-MACs for "enhanced" marimba blanks (final quality).



The resulting demotion to "bad" for blank 12 is evidence to suggest that variations in its structural properties exist that affect modal properties important to the musical qualities of the resulting tuned bar. This was also suggested by CMU in regard to the microstructure study (see section 5.4), where there was no strong correlation at a scale of approximately 600–800 μm between the organizational pattern of the wood and the quality of the blanks.

Anecdotal evidence from tuners in the industry suggests that marimba bars at higher notes (smaller size bars) made of synthetic material may be more comparable in musical quality to their rosewood counterparts than those of lower notes (larger bars, such as C2 in this study). It is also agreed that higher-note bars are easier to tune, and they are more predictably classified as blanks. If one can reasonably assume that a manufacturing process for synthetic marimba blanks is regular and repeatable and that microstructure organization does not correlate with musical quality, the implication is then that synthetic blanks do not suffer from some of the unpredictability associated with larger-scale variations in rosewood structural properties.

Much of this evidence suggests that there is a macro-scale variation in the wood structure affecting one or more of the following: density, loss factor (damping), or stiffness. Knots in wood are indisputable examples of naturally occurring wood grain variation and are often avoided by tuners when selecting blanks for marimba keys. It should be noted that these variations may be present and changing in all three directions within the grain. If true, this implies that the wood removed from the blank initially when tuning (the undercut) may be beneficial or detrimental to the original blank's musical qualities: blank 12 became completely unusable, and blank 52 was elevated to the "enhanced" tier, even though the blank's global damping values were well within the "traditional" tier expectations, quantitatively speaking. Also keep in mind that although undercuts may or may not sound bad, when examined alone, their integration with the original may have still had a synergistic relationship, falsely categorizing the blank into a higher tier than it should have been before the undercut was made.

If one can envision a synthetic blank with modal characteristics similar to those of blank 3, created through a manufacturing process that allows for specific and repeatable material properties throughout the longitudinal direction of the blank, modal symmetry should also be achievable and practically automatic by the nature of the process. Achieving the desired damping values for several of the resulting modes is likely the most challenging aspect when considering the design of a high-quality synthetic replacement.

6.5. Recommendations and Future Work

The information obtained from this test effort can be used to identify and iterate on a replacement synthetic material for Honduran rosewood as used in the creation of marimba instruments. There is still more information that can be postprocessed, including self-MACs and cross-MACs for lateral and axial mode shapes. Such information could bring further insight in determining what influence lateral or axial modal properties have on musical quality. It would also be worthwhile to obtain a statistical sampling of modal parameters and shapes of the same blank to quantify error, since the differences in modal damping and mode shape symmetry are small.

Additional testing on the final tuned marimba bars would be useful in providing evidence regarding the influence that varying wood properties have on the musical quality of the tuned bars. For example, it would be useful to determine the final damping values of blank 52 and compare those against the final damping values of the remaining bars. This would give insight into what character the undercut gave the original blanks initially.

MACs on the tuned bars would also be useful in determining certain quality properties. An example would be how symmetric the torsional modes are, which can affect the size and location of "sweet spots" on a tuned bar.

Though the above-mentioned investigations would reveal further insight into marimba blank material properties, the development of a synthetic replacement would likely be an iterative process. A potential development path would involve multiple steps and iterative processes like the one outlined below.

1. Select a subset of candidate materials from Figure 5-6.
    a. Obtain samples and create an equally sized rosewood geometry sample (ideally the same geometry as a C2).
        i. Conduct a modal survey on the synthetic samples and equivalently sized rosewood sample.
        ii. Compare results and determine which synthetic material most closely matches the tonal qualities of the rosewood or otherwise appears to have the best potential.
2. Use results from modal testing to create a finite element model (FEM) of the selected synthetic material and correlate the model to match this sample's modal properties.
3. Vary the model in ways that can be manufactured to determine tonal impact using finite element modal analysis.
    a. Find a modification that shows promise and obtain a sample of the material from a manufacturer capable of incorporating the changes.
        i. Alternatively, modifications might involve changes that can be done after the part is received (e.g., drilling holes, routing, adding stiffeners).
4. Conduct another modal test on the new synthetic candidate.
    a. Determine if the modal test meets musical standards.
    b. If not, correlate with the FEM again to verify that the proposed changes were successfully implemented or to correct the model further.
        i. Continue iterating the design and repeat steps 3 through 4b until a replacement rosewood synthetic material has been found.

Other options to consider for finding a replacement material might include the use of multiple types of materials such as elastics, metals, and hard plastics that have been combined to meet the musical standards required by musicians. Blanks or bars could even be 3-D printed with patterns, holes, voids, or grooves for other materials to seat into. The number of possibilities with the potential to create a synthetic replacement is large. The design, analysis, and testing process described above could also be key not just to inventing a sustainable synthetic replacement for traditional quality marimba bars, but possibly to create bars of exceptional quality.