

Developing Human Wellbeing Indicators Related to the Natural Environment for Whatcom County

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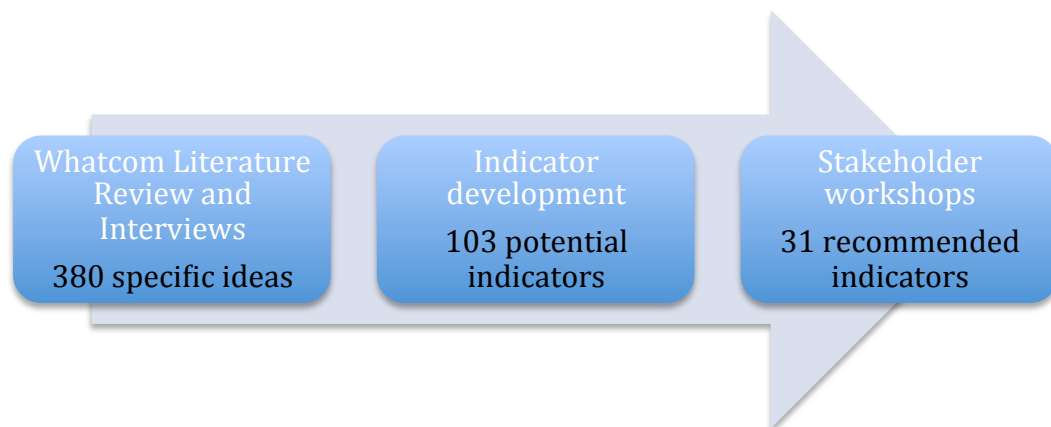
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Summary

Many facets of human wellbeing are directly related to the health of the natural environment such as the ability to release stress in a peaceful setting or a thriving local economy derived from diversified agriculture. The status of our wellbeing can influence the way we make decisions that affect the environment and the status of natural resources, in turn, can affect our wellbeing. In many cases, this perspective is left out of environmental management decisions.

Because of a growing understanding of the relationship between HWB and the status of natural resources, planning for and monitoring human wellbeing as a component of resource management is a growing trend. Many of Whatcom County's policies within the Comprehensive Plan address natural resource management and require consideration of diverse social needs. The actual incorporation of human wellbeing into these types of policies is often limited, however, because of a lack of guidance for developing indicators to begin addressing HWB in practice. With the identification of diverse metrics of wellbeing, and data reported according to different demographics about their wellbeing status, we may be able to develop better policies that compliment diverse aspects of human wellbeing and ecological health.

In 2014, the UW Puget Sound Institute collaborated with Whatcom County to develop potential wellbeing indicators related to the environment. The process involved several steps of compiling, creating, drating and refining potential human wellbeing indicators that related the values of Whatcom residents to the health of Whatcom ecosystems (Figure 1). These steps included 1) an analysis of values of Whatcom residents related to the environment from interviews and literature review, 2) development of potential indicators from Whatcom values, and 3) ranking and refinement of indicators with Whatcom residents.



Indicators were developed to represent six domains of Human Wellbeing related to the environment: Psychological, Physical, Cultural, Social, Economic and Governance. In the workshop phase, 103 indicators were presented to 28 workshop participants in three workshops (Lynden, the Rome Grange and Bellingham). From this initial list of 103, 31

were highly rated for relevance and importance in at least two workshops. We recognize that perspectives of wellbeing are diverse, and that this process prioritizes values that are most commonly held. As a result, some important, but less commonly held, perspectives may not be in this list.

Data for some of these indicators are available from regional and national sources. Many, however, will require a regular household survey or independent analyses of existing data.

Table 1. Human wellbeing indicators related to the environment recommended during at least two workshops.

Domain	Attribute	Indicator	Potential Data Source
Physical	Healthy Foods	Average household distance to fresh produce (personal farm, grocery store, farm stand)	Whatcom Community Health
	Access to healthy food	# shellfish bed closures per year	Department of Ecology
	Access to public spaces	% of households that have access to a park, play area, or trail within ½ mile (urban) or 10 miles (rural)	Whatcom County
	Outdoor activity	% of people and frequency of outdoor activity (by activity: outdoor work, boating, gardening/farming, walking, bicycling, ATV riding, etc.)	Start with BRFSS
	Air quality	Number of moderate air quality days in urban and rural areas per year	Whatcom County Health Department for urban
	Water quality	% of drinking water systems that comply with relevant water quality standards	Whatcom County Health
Psychological	Freedom	% of residents, by demographic, who feel they have sufficient choices in accessing and experiencing the natural environment	Survey
		% of residents, by demographic, who feel that environmental protection regulations are impairing their quality of life	Survey
	Pride	% of residents, by demographic, who feel a sense of pride in stewarding natural resources	Survey
Governance	Effective government	Average and maximum number of days to process a permit by permit type (from submission to decision)	Whatcom County
	Collaboration	Number of resource management issues in which governments collaborate	Staff Survey
	Open Participation	% of residents, by demographic, who feel they have the opportunity to influence natural resource decisions if they wanted to	Survey
	Stewardship	% of residents, by demographic, who feel that efforts of local government to encourage and practice stewardship are diverse and supported by a wide range of interest groups	Survey
	Transparency	% of residents, by demographic, who feel that local resource management decision-making is transparent	Survey
	Trust	% of residents, by demographic, who trust local government to make the right decisions to protect natural resources	Survey
Social	Community Cohesion	% of residents, by demographic, who trust and respect people in their surrounding community and in other parts of the county*	Survey
		% of residents, by demographic, who value the contribution of natural resource industries (e.g. logging, farming, fishing, mining)	Survey

		% of residents, by demographic, who feel that they understand the differences of both city and rural lifestyle choices#	Survey
		% of residents, by demographic, who feel they have a voice in their community*	Survey
	Future Generations	% of residents, by demographic, who feel that the next generation will have a better/worse quality of life than current generation	Survey
	Safety	% of people who feel safe outdoors in their neighborhood	Survey
Cultural	Cultural events	Number of or participation in cultural events associated with the outdoors or natural resources (i.e., First salmon ceremony, Stommish, Pioneer Days, Ski to Sea, Reef Net Festival, Water Weeks, Whatcom County Fair, etc.)	Start with tourism board
	Cultural practices	Percent of residents who feel they are able to maintain cultural practices associated with natural resources	Survey
Economic	Industry Capacity	Number, size and profitability of natural resource-based businesses working within Whatcom County (working farms, timber mills, fishing canneries)	USDA
		% of farms and rural residents without water rights	
		# of acres of forest and farmland in active production and # of permitted or locally based boats	Start with Whatcom Conservation District
	Industry Viability	Relative Market value of forest, fisheries and agricultural products sold locally, regionally, within the US and exported	USDA/NRCS, Farm Bureau, Pacific Coast Shellfish Growers Association, etc.
		Relative contribution of local and non-local natural resource industries to Whatcom County economy (forestry, agriculture, fisheries; by commodity if desired; include supporting businesses)	WSDA
	Jobs/Income	% of total wages in county paid by natural resource based industries	USDA, Whatcom Fishermen's Association, etc.
		Unemployment rate by economic sector*	USDA, etc.
	Livable Community	Cost of living index for rural and urban households (septic, water, electric, permit costs, etc.)*	Start with Whatcom Farm Friends

Indicators highlighted in green were recommended in all three workshops (Physical and Cultural indicators were only discussed in two workshops)

Although it was highly rated with this wording, I'd consider rewording to whether individuals feel that their livelihood choices are understood by others in the county

* Not specific to environmental management issues, but very intertwined and at the heart of core issues in Whatcom County

Background

Human wellbeing (HWB) is multi-faceted and can be enhanced, or negatively affected, by our daily experiences, such as the quality of our work life and personal relationships, our engagement in physical activity and adherence to a healthy diet, and opportunities to participate in cultural activities. Many facets of wellbeing are directly related to the health of the natural environment such as the ability to release stress in a peaceful forest or a thriving local economy derived from agriculture. The status of our wellbeing can influence the way we make decisions that affect the environment and the status of those resources, in turn, can affect our wellbeing. In many cases, this perspective is left out of environmental management.

Human wellbeing and quality of life are partly subjective. What makes one person happy and healthy may not be the same for another person. For that reason, we are cautious to seek indicators of wellbeing and quality of life that transcend individuals. Because of the sense of different values between rural and urban residents, and between farmers, foresters, fishermen, and tribes, it is particularly important to collect demographic data and explore trends in these indicators by longevity in region and rural vs. urban residence. Do both rural and urban residents feel their interests are being represented in resource management decisions? Are they all able to pursue their preferred livelihood strategies? Are both rural and urban residents experiencing high air and water quality?

Because of a growing understanding of the relationship between HWB and the status of natural resources, planning for and monitoring human wellbeing as a component of resource management is a growing trend. Many of Whatcom County's policies within the Comprehensive Plan require consideration of diverse social needs. The actual incorporation of human wellbeing into these types of policies has been limited, however, because of a lack of guidance for developing indicators to begin addressing HWB in practice. There are several purposes for developing such indicators. First, it is well known that the conversation about resource management is often one-sided. With the identification of diverse metrics of wellbeing, and data reported by different demographics about their wellbeing status, we can make better attempts to develop policies that compliment diverse aspects of human wellbeing and ecological health.

The Puget Sound Institute collaborated with Whatcom County to recommend HWB indicators related to the health of Whatcom County's natural environment. This report summarizes the methods and results. The resulting indicators may be helpful for identifying indicators to monitor the social impacts of natural resource specific strategies within the Comprehensive Plan. Additionally, the indicators will be compared to similar processes in the Hood Canal and Puyallup watersheds to determine if any are applicable to the entire Puget Sound to become part of the PSP Quality of Life indicators.

Methods

Methods were adapted from several international efforts to incorporate social, economic and cultural indicators into coastal and watershed planning processes (e.g., Tipa 2009; Day and Prins 2013). The process involved iterative phases of gathering and refining potential attributes and indicators with soliciting feedback from local citizens and experts in participatory one-on-one formats.

PREPARING POTENTIAL INDICATORS

To begin the process, the author and two researchers compiled existing data about Whatcom County residents' values. These data came from various reports, such as Whatcom County public health documents, planning documents, and regional surveys (Appendix I). We also conducted 24 in person interviews and one focus group with 15 adults. The interviews focused on one primary question, "How does the natural environment of Whatcom County contribute to your wellbeing?" Whatcom County provided the names of members of different boards and committees from which we selected our initial interviewees. Subsequent interviewees were identified by each interviewee by asking for recommendations of people who have different perspectives from them (Appendix II).

We coded data from the documents and interviews into one of six human wellbeing domains: Psychological health, Social health, Cultural health, Economic wellbeing, Governance and Physical health. In the process, we created attributes (a more specific category to the domain, but not yet a measurable indicator) that best represented the concept and potential indicators that would measure the specific aspects of the attributes. Example attributes included "outdoor activity" and "air quality" for the physical domain, which could be measured by the indicators "% of people and frequency of outdoor activity" or "number of moderate air quality days," respectively. This resulted in 380 potential indicators spread across the six domains.

To narrow the potential indicators to a number that would be workable in workshops, and ideally indicators for which data was already regularly collected, the primary author omitted indicators that would be very difficult to measure and then had 4 people internally rank the indicators on a scale of 1-5 for relevance. This resulted in 103 potential indicators to present for feedback during the workshops.

REFINING AND RANKING INDICATORS

To reduce this list to a more manageable set of indicators we used the following criteria to refine and rank the potential indicator list based on:

Relevance	Importance
How well the indicator represents the issues of the Whatcom County	How important the indicator is in relation to the other indicators to provide a complete representation of the

Criteria used in the indicator selection process.

These criteria were selected to enhance the robustness of the selection process and are a subset of criteria used in other indicator ranking processes (i.e., Kurtz et al. 2001; Kershner et. al 2011; and Day and Prins 2013).

The author facilitated three stakeholder workshops with active citizens and professionals who had regional expertise in measurement or first-hand-knowledge of one of the domains. A list of potential participants was put together based on recommendations from the interviews, the literature review, and Whatcom County. A total of 28 participants from the 76 invited attended the workshops. Fifteen of the invitees expressed interest in participating but were not available on the designated days (11 needing to cancel last minute due to professional or personal reasons). Ten participants attended the workshop in the town of Lynden, 6 at the Rome Grange, and 12 in the city of Bellingham. While we acknowledge the small group size, this is a common size for specialized working groups comprised of people with the most regional understanding of a topic. These 28 participants represented diverse perspectives as rural residents, public health scientists, economic development representatives, and active citizens in economic and cultural activities. This does not mean they represented all perspectives from those stakeholders, however, and we also note that they did not represent tribal perspectives.

Each participant was assigned to one of four small groups focused on 1 to 2 of the domains. They were informed of their group placement and provided the indicator list prior to their attendance at the workshop (Appendix III). Examples of Economic group participants included representatives from economic development, extension services, and private businesses; the Social/Psychological group had representatives from the regional public health department, a community foundation, an environmental psychologist, and retired forester; the Governance group included representatives from county council, rural citizens, and urban citizens; and the Physical group had representatives from county health departments, county extension and recreation groups. Each group was provided 17-27 indicators from which they were asked to refine and prioritize to less than ten to facilitate the narrowing of indicators to the most relevant.

We asked workshop participants to complete two steps to refine and rank potential indicators.

Step 1

The first step was to independently rate each indicator for relevance to the region, placing green (good indicator), yellow (potentially good but needs modification), and red (not relevant) sticker dots on poster-sized printouts of the indicators for their domain. This first step allowed participants to see where they had some agreement and allowed the second step to proceed more efficiently.



Example of posters from Step 1. Photograph from Puyallup Watershed workshop.

Step 2

In the second step, each group worked with a facilitator to refine their list of indicators to less than ten based on relevance and importance. In this step they were also invited to add any indicator or attribute that they perceived as critical. Each group was facilitated by a member of the research team who kept detailed notes of the conversations either in an Excel spreadsheet or directly on the printouts of indicators. Results from all workshops were compiled; indicators that were prioritized in at least two out of three workshops were automatically retained and new indicators were created based on stakeholder comments if the concepts were discussed in at least two workshops. This resulted in 31 indicators that reflected stakeholder input on the most relevant and important measures for each domain.

Recommended Indicators

We present a list of 31 HWB indicators that participants believed to be relevant and important in at least two workshops. Four were highly ranked in all three workshops, although the Physical and Cultural domains were only discussed in two workshops so there was not an opportunity for them to be ranked three times. We also provide five indicators to be considered because although they were only mentioned in one workshop, they represent ideas frequently expressed in the interviews.

Unless noted, the indicators are specific to the way residents interact with Whatcom County's natural environment; including upland, freshwater and estuarine ecosystems.

Many of the indicators selected during the process require direct data collection from Whatcom County residents. The easiest way to collect such data is with a randomized phone, mail, or Internet survey. We can ensure that the data represent the overall population by comparing respondent demographics with overall demographics of the region. Any demographics with low representation can be weighted, if desired, to better represent the population. Other indicators, however, already have data being collected for them by other agencies. We note whether a new survey would be required (“Survey”) or the name of the specific data source that would provide such data.

It is important to remember that:

- All indicators must be disaggregated by demographic variables to understand equity issues, one of the most important aspects of HWB:
 - Urban vs. Rural residence
 - Socioeconomic status
 - Age
 - Gender
 - Time living in Whatcom County
 - Ethnicity or Tribal/Non-tribal
- Indicators are not targets. They are a measure of the status of a specific aspect relevant to HWB associated with natural resources
- Consequently, it is not necessarily desirable that the unit of measure of an indicator increases. The measure *only* demonstrates the status of the indicator. It is still up to people to analyze the implications of that measure.

Table 1. Indicators recommended by at least two of the three workshops.

Domain	Attribute	Indicator	Potential Data Source
Physical	Healthy Foods	Average household distance to fresh produce (personal farm, grocery store, farm stand)	Whatcom Community Health
	Access to healthy food	# shellfish bed closures per year	Department of Ecology
	Access to public spaces	% of households that have access to a park, play area, or trail within ½ mile (urban) or 10 miles (rural)	Whatcom County
	Outdoor activity	% of people and frequency of outdoor activity (by activity: outdoor work, gardening/farming, walking, bicycling, swimming, etc.)	Start with BRFSS
	Air quality	Number of moderate air quality days in urban and rural areas per year	Whatcom County Health Department for urban
	Water quality	% of drinking water systems that comply with relevant water quality standards	Whatcom County Health
Psychological	Freedom	% of residents, by demographic, who feel they have sufficient choices in accessing and experiencing the natural environment	Survey
		% of residents, by demographic, who feel that environmental protection regulations are impairing their quality of life	Survey
	Pride	% of residents, by demographic, who feel a sense of pride in stewarding natural resources	Survey
Governance	Effective government	Average and maximum number of days to process a permit by permit type (from submission to decision)	Whatcom County
	Collaboration	Number of resource management issues in which governments collaborate	Staff Survey
	Open Participation	% of residents, by demographic, who feel they have the opportunity to influence natural resource decisions if they wanted to	Survey
	Stewardship	% of residents, by demographic, who feel that efforts of local government to encourage and practice stewardship are diverse and supported by a wide range of interest groups	Survey
	Transparency	% of residents, by demographic, who feel that local resource management decision-making is transparent	Survey
	Trust	% of residents, by demographic, who trust local government to make the right decisions to protect natural resources	Survey
Social	Community Cohesion	% of residents, by demographic, who trust and respect people in their surrounding community and in other parts of the county*	Survey
		% of residents, by demographic, who value the contribution of natural resource industries (e.g. logging, farming, fishing, mining)	Survey

		% of residents, by demographic, who feel that they understand the differences of both city and rural lifestyle choices#	Survey
		% of residents, by demographic, who feel they have a voice in their community*	Survey
	Future Generations	% of residents, by demographic, who feel that the next generation will have a better/worse quality of life than current generation	Survey
	Safety	% of people who feel safe outside in their neighborhood	Survey
Cultural	Cultural events	Number of or participation in cultural events associated with the outdoors or natural resources (i.e., First salmon ceremony, Stommish, Pioneer Days, Ski to Sea, Reef Net Festival, Water Weeks, Whatcom County Fair, etc.)	Start with tourism board
	Cultural practices	Percent of residents who feel they are able to maintain cultural practices associated with natural resources	Survey
Economic	Industry Capacity	Number, size and profitability of natural resource-based businesses working within Whatcom County (working farms, timber mills, fishing canneries)	USDA
		% of farms and rural residents without water rights	
		# of acres of forest and farmland in active production and # of permitted or locally based boats	Start with Whatcom Conservation District
	Industry Viability	Relative Market value of forest, fisheries and agricultural products sold locally, regionally, within the US and exported	USDA/NRCS, Farm Bureau, Pacific Coast Shellfish Growers Association, etc.
		Relative contribution of local and non-local natural resource industries to Whatcom County economy (forestry, agriculture, fisheries; by commodity if desired)	WSDA
	Jobs/Income	% of total wages in county paid by natural resource based industries	USDA, Whatcom Fishermen's Association, etc.
		Unemployment rate by economic sector*	USDA, etc.
	Livable Community	Cost of living index for rural and urban households (septic, water, electric, permit costs, etc.)*	Start with Whatcom Farm Friends

indicators highlighted in green were recommended in all three workshops (Physical and Cultural indicators were only discussed in two workshops)

Although it was highly rated with this wording, I'd consider rewording to whether individuals feel that their livelihood choices are understood by others in the county

* Not specific to environmental management issues, but very intertwined and at the heart of core issues in Whatcom County

Other Indicators to Consider

Although only recommended in one workshop, the following indicators represent ideas that drew upon common themes from the interviews and are worth taking into consideration.

Economic	Industry capacity	# of locally-based educational opportunities for natural resource industries (Technical college, 4H, future farmers, WSU, etc.)
Social	Community Cohesion	% of rural residents who feel they are being environmentally discriminated against
Governance	Leadership	Diversity of perspectives and participants in natural resource decision-making (advisory boards, councils, etc.)
	Fairness	% of residents who feel that county government treats people unfairly
	Listening	% of residents who feel they are listened to by the government when they have attempted to share their perspectives

Potential Uses of Human Wellbeing Indicators

These recommended indicators are presented to Whatcom County for their consideration. Depending on the final objective for using these indicators, Whatcom County will want to undergo their own process to select the indicators most relevant to the objective. They can then be used in a variety of ways. Some examples include:

- 1) **Assessing the state of HWB related to the natural environment.** This can be done at a single instance or compared over time. Numerical measures for each indicator can be presented at time “x” and change over time can also be explored to demonstrate increasing or decreasing trends in HWB.
- 2) **Monitoring the impacts of regulations or strategies.** Once we calculate if any indicators are changing over time, we can collect qualitative data or run statistical models to explore whether any changes in indicator status (increases or decreases) are likely results of Whatcom County activities. For example, we may find that the multiplier effect for certain agricultural products has increased over six years. We can test if this could be due to a strategy that reduced regulations on agricultural lands, or if it is more likely due to other factors.
- 3) **Assisting the selection of strategies that are most appropriate to enhance or at least not harm the current status of HWB.** When we are considering the removal or placement of environmental management strategies, we want to consider the

potential impacts on HWB. This is because we want to enhance HWB while we enhance ecosystem health. It is also because we want to implement strategies that will address, and not exacerbate, human pressures on ecosystems. To do so, we will need to model these potential relationships between HWB and the environment. There are at least three details to consider when trying to prioritize strategies that enhance both ecological and human wellbeing:

- a. **Prioritizing regions or demographics in order to address specific HWB needs.** Selecting activities that benefit HWB might include prioritizing regions based on their specific HWB status. Disaggregated data by region and demographics can be used to aid decision-making about where to prioritize strategies that might benefit specific regions or demographics. For example, if governance of natural resources is considered strong in one town but weaker in another, we may choose to prioritize strengthening governance in the weaker town.
- b. **Prioritizing strategies that most likely influence multiple domains of HWB.** Another aspect of selecting activities that benefit both ecology and human wellbeing is to use research data about the relationship of HWB indicators to specific ecological components to choose strategies that are most likely to enhance a variety of HWB domains. For example, enhancing the agricultural practices is likely to enhance all aspects of human wellbeing, from cultural practices to natural resource-based income.
- c. **Understanding HWB tradeoffs.** A critical piece to selecting strategies that benefit ecosystems and HWB is to understand any potential tradeoffs among HWB domains. For example, while family outdoor time might increase for some, natural resource based jobs and income might decrease for others. We would need to use scientific data or structured decision-making processes to consider how to handle this tradeoff when selecting an activity.

Conclusions

This multi-step process for developing HWB indicators for Whatcom County provides an example of how to combine scientific evidence on wellbeing factors with local priorities and knowledge to develop indicators.

Most of our lessons, as usual, were learned during the stakeholder workshop process, which is where we try to translate complex information into a standardized language of indicators. This is a very uncomfortable process for many and we recognize that it left out important populations, including the tribes. Additionally, because the focus of this project was to look at wellbeing related specifically to the environment, some of the biggest issues in Whatcom County are not directly addressed with these indicators. For example, rural economies and costs of living are not necessarily within the purview of natural resource

managers, although these are considerable challenges that need to be addressed by Whatcom County in general.

That said, the majority of those who attended the workshops found the experience to be informative and interesting (Appendix IV). Refining and ranking indicators is not an easy task no matter how it is presented, but it appears that this deliberate process was helpful in making the process reasonable. In fact, from a list of 15 potential positive and negative adjectives to describe the workshops, participants most often selected interesting (87% of respondents) and organized (61%) (Appendix IV). They also selected challenging (65%) and rated the ease of completing the ranking tasks a 6.9 out of 10 (N=23). Thus, although the ranking and rating tasks were difficult, when organized and facilitated, they can become a positive experience.

Throughout the process, a few participants expressed concerns with indicators that should be reflected upon. Here I provide my own perspective in response.

- **Surveys for subjective measures may be costly.**
In fact, surveys can be conducted fairly cheaply (~\$10K), especially considering this is an opportunity to elicit public data from a diverse population. This is magnitudes cheaper than the expenses of ecological or economic data collection.
- **Individual responses collected for this sole purpose can be inflated by groups who create a common message for everyone to use when responding**
This can be partially true, but is always the case when public responses are solicited; the same is true for public meetings. Using appropriate survey sampling techniques, however, can mitigate this impact and ensure that diverse perspectives are considered. I would recommend stratified sampling and consider survey companies with quick turnaround times, such as Google Analytics or Knowledge Networks.
- **Underrepresented populations will not be represented through standard summary statistics and sampling procedures.**
This is a critical point that needs to be taken into consideration. A primary issue in human wellbeing is social justice, which means taking into consideration the most vulnerable populations to policies and development trends. This means that not only does data need to be collected from these populations, but they also need to be reported separately rather than providing overall means. In Whatcom County, it is clear that rural and tribal perspectives need to be given serious consideration even as the urban populations are growing.

References

Day, A. and M. Prins. 2013. Developing Human Wellbeing Indicators for Canada's Pacific Marine Ecosystems: Steps and Methods. Uuma Consulting Ltd., Nanaimo, British Columbia.

Hanein, A. and K. Biedenweg. 2012. Wellbeing Indicators in the Puget Sound Basin: A summary and categorization of types of social indicators and metrics used by government and non-government agencies in the Puget Sound Basin. Puget Sound Institute. Available at: <http://www.eopugetsound.org/articles/well-being-indicators-puget-sound-basin>.

Kershner, J., J. Samhouri, C.A. James, P. Levin. 2011. Selecting Indicator Portfolios for Marine Species and Food Webs: A Puget Sound Case Study. PLoS ONE 6(10):e25248.

Kurtz, J., L. Jackson, and W. Fisher. 2001. Strategies for evaluating indicators based on guidelines from the Environmental Protection Agency's Office of Research and Development. Ecological Indicators 1:49-60.

Tipa, G. 2009. Exploring Indigenous Understanding of River Dynamics and River Flows: A Case from New Zealand. Environmental Communication: A Journal of Nature and Culture 3(1): 95-120.

Appendix I: Sources for Whatcom Document Review

Title of Document	Year
WRIA 1 State of the Watershed	2010
WRIA 1 About the Watershed – Agriculture	2009
City of Everson Economic Development Work Plan	2011
Lynden 2024: Chapter 1 Goals and Policies	2012
It Matters how we get there: Whatcom Transportation Policy Steering Committee	2002
Lake Whatcom Comp. Stormwater Plan	2008
Public Involvement Report: WC Ag Land Program	2008
Whatcom Prosperity Project	2011
City of Everson Comprehensive Land Use Plan	2004
Whatcom County Agricultural Strategic Plan	2011
Whatcom County Community Action Plan: WC Health	2010
Whatcom County BRFSS Report	2008
Community Health Improvement Plan	2013
A Survey of Whatcom County Nonprofits	2010
WRIA 1 Long Range Plan for Public Involvement and Education	2001
Lake Whatcom Reservoir Management Program	2010
Lake Whatcom Management Program 2013 Report	2014
Whatcom County Values and Beliefs Survey	2009
Whatcom County Community Health Assessment	2012
Whatcom Futures Strategic Vision and Goals	2012
City of Bellingham Legacies and Strategic Commitments	2009
City of Everson Public Opinion Survey Results	2004

Appendix II: Interviewee and Workshop Attendee Information

INTERVIEWEE REPRESENTATION (24 individual + 1 focus group of 15 adults)

- Included a purposeful mix of political party affiliation and different perspectives on current issues such as coal terminal and water rights
- 10 women & 14 men in 20-60minute one-on-one interviews
- 9 men, 6 women, 3 children in focus group

Of the 24 1on1 interviews:

Lummi tribal members (2)
Retired forester
Retired commercial fisherman
Agricultural consultants (3)
Local politicians (2)
Planning consultants (2)
New rural resident (<30 yrs) (2)
Long-time rural residents (>30 years) (4)
New urban resident (<30yrs) (3)
Long-time urban resident (>30yrs)
Unitarian fellow
Economic development professionals (2)

Length of residence

3=0-9 years
5 = 10-19years
8 =20-39 years
8=40 years or more

Place of residence

14=Rural (+15 at focus group)
10=Urban/suburban

WORKSHOP ATTENDEES (28)

Whatcom Public Health Department (3)
Public Health Advisory Board (1)
Forestry advisory committee (1)
NW Agricultural Business Center (1)
Lynden Chamber of Commerce (1)
Farm Friends (1)
Whatcom Community Foundation (1)
WSU Extension (1)
Planning consultants (2)

Port of Bellingham (1)
Whatcom County & County Council (4)
Whatcom Conservation District (1)
WWU Economic Department (1)
Unitarian Fellowship (1)
Recreation Northwest (1)
Whatcom Community College (1)
Rural community citizens (5)
Urban community activist (1)

Appendix III: Initial Workshop Indicators for Refinement

Group 1: Physical and Cultural

#	Domain	Attribute	Indicator wording
1	Physical	Access to local food	Per capita percentage of food consumed that is local
2			% of residents, by demographic, who are able to harvest as much local foods as they would like (wild or from farms/gardens)
3			Average household distance to fresh produce (personal farm, grocery store, farm stand)
4		Access to natural resources	Number of beach closure days annually
5			% of residents, by demographic, who feel that there is available/suitable access to water/shoreline
6			% of households that have access to a park, play area, or trail within ½ mile (urban) or 10 miles (rural)
7			Total miles of connected trail systems by subgeography throughout county
8			Number of parks and trails that are available/accessible for all ages & abilities
9			Walkability scores
10		Air Quality	Number of moderate air quality (particulate matter levels) days per year at Bellingham Station
11		Outdoor activity	% that feel benefit from a variety of outdoor activities in region
12			% of people and frequency of outdoor activity (by activity: hiking, beach walking, etc.)
13		Drinking water	% of households with access to clean drinking water
14			Trihalomethane, Chlorophyll, phosphorous, fecal coliform contaminant levels in drinking water
15		Healthy local Foods	# shellfish beds closures per year
16			Number of algae related health incidents reports

1 7		Water Quality	Amount of phosphorous runoff into local waterways
1 8			# impaired lakes, streams, bays
1	Cultural	Cultural events	Number of or participation in cultural events associated with the outdoors or natural resources (i.e., Pioneer Days)
2		Cultural heritage	# of lands, sites and structures that have historical or archaeological significance that are identified and preserved
3			# of place names with cultural significance
4		Cultural Practices	Percent of residents who feel they are able to maintain cultural practices associated with natural resources

Group 2: Governance

#	Domain	Attribute	Indicator wording
1	Governance	Collaboration	Number of resource management issues in which county and city governments collaborate with the tribes
2		Development	Ratio of acres of undeveloped land to developed land
3			Rate of land development by land use class
4			% of residents, by demographic, that perceive that balance has been achieved in economic development and environmental protection
5			Diversity of natural areas maintained
6			Acres in zoning for farm, urban, industrial, protected areas, etc.
7			# Acres being managed under an agriculture/conservation program (CREP/CPAL) in watershed
8			Density of new development
9			% of new residences within UGB vs. outside of UGB
10			Mileage of shorelines and tidelands that are protected from development
11			% of residents, by demographic, who feel their is sufficient protection for wildlife habitat (including fish and other species)
12		Enforcement	% of residents, by demographic, who think the county has effective enforcement of policies
13		Effective Government	Percent of residents who feel the environmental regulations are appropriate
14		Leadership	Percent of residents who feel there is effective leadership for natural resource issues
15		Open Participation	% of residents, by demographic, who feel that their interests are incorporated into resource management decisions (by rural, urban, tribal, suburban, forestry and agricultural zones)
16			% of residents, by demographic, who feel they have the opportunity to influence political affairs if they wanted to
17		Stewardship	Amount of funds dedicated to natural resource protection/restoration

18			Number of water conservation tools distributed/installed citywide (water conservation kits and rain barrels sold)
19			Number of citizens involved in stewardship programs annually
20			% of residents, by demographic, who engage in stewardship practices on a daily/weekly basis
21			Number of community coalitions, taskforces and workgroups focusing on policy, environmental and system change strategies from baseline to target.
22			Number of industries following clean operating standards
23		Transparency	% of residents, by demographic, who feel that local resource management decision-making is transparent
24		Trust	% residents, by demographic, who feel that personal water rights are not secure
25			% of residents, by demographic, who trust local government to protect natural resources

Group 3: Psychological and Social

#	Domain	Attribute	Indicator wording
1	Psychological	Aesthetics	% of residents, by demographic, who are able to experience beautiful natural environments daily
2			% of residents, by demographic, who feel that beauty, natural surroundings, and scenery is valued most about living in Whatcom County
3			% of residents, by demographic, who experience natural quiet on a daily basis
4		Fear	% of residents, by demographic, who feel fear about their future ability to steward natural resources
5		Freedom	% of residents, by demographic, who feel they have sufficient personal freedom and choices
6		Place Identity	% who would not want to live anywhere else
7			% of residents, by demographic, who feel connected to Whatcom County
8		Positive Emotions	% who felt a sense of awe by the natural environment in the region in the past year
9			% of residents, by demographic, who felt reduced stress in the past year as a result of being in the environment
10			% that feel an emotional connection to knowing that the surrounding environment is healthy and available
11		Pride	% of residents, by demographic, who feel a sense of pride in stewarding natural resources
12		Sense of Space	% of residents, by demographic, who feel they have the privacy they need to be happy
13		Spirituality	% who felt a spiritual connection while in the local natural environment in the past year
14		Subjective Wellbeing	% who perceive that Whatcom County/Nooksack Watershed is a unique place that contributes to personal wellbeing
1	Social	Community Cohesion	% of residents, by demographic, who trust people in their surrounding community
2			% of residents, by demographic, who have worked with other residents to manage resources, solve community challenges, or share harvested goods in the past year
3			% of residents, by demographic, who say that their relationships with community would not be the same without Whatcom's existing natural resources

4			% of residents, by demographic, who feel that others in the county appreciate the work/products/necessity of natural resource industries for their quality of life
5			% of residents, by demographic, who feel that other community members feel ownership of and share broader community stewardship goals
6			% of residents, by demographic, who feel that they understand the opposite side of rural-urban divide
7			Number of or participation in community events associated with the environment (e.g., Pioneer Days)
8			% of residents, by demographic, who perceive that their community is engaged in natural resource stewardship
9			% residents who report a positive connection to the community
10		Future Generations	% of residents, by demographic, who feel they are able to pass their stewardship activities on to future generations
11			% of residents, by demographic, who feel that the next generation will have a better/worse quality of life than current generation
12		Rural character	% of residents, by demographic, who appreciate the rural atmosphere of Whatcom County
13		Safety	% of people who feel safe walking or biking in their neighborhood
14		Strong relationships	Frequency of sharing local foods with family
15			Frequency of sharing outdoor experiences with friends or family

Group 4: Economic

#	Domain	Attribute	Indicator wording
1	Economic	Economic Contribution	Market value of forest, fisheries and agricultural products sold locally and exported
2			% contribution of local and non-local natural resource industries to Whatcom County economy (forestry, agriculture, fisheries; by commodity if desired)
3			Total taxes paid to county by natural resource-based industries
4			Direct and indirect profit by sector (agriculture (by commodity), forestry, fisheries (commercial & recreational), shellfisheries, tourism)
5		Industry	Number of natural resource-based businesses working within Whatcom County (working farms, timber mills, fishing canneries)
6			Number of acres of forest and farmland in production
7			Average acreage of forest and farm businesses
8		Industry Support	Diversity of participants in natural resource decision-making (advisory boards, councils, etc.)
9			% farms with water rights
10		Jobs/Income	% of households with primary income from natural resource industries within each economic bracket (by industry)
11			Job growth by natural resource sector
12			% of total wages in county paid by natural resource based industries
13			Unemployment rate (by age and geographic scope: urban, rural, suburban)
14			% of avg. monthly employment in natural resource based industries (break down by age classes and by industry: timber, ag, fisheries)
15		Livable Community	Ratio of price of an acre of land to median income (by land type: urban, rural, agricultural)
16			% of residents, by demographic, able to buy house (Or Housing Affordability Index - Port of Bellingham/WA state)
17		Local Economy	% of locally derived natural resource products that are distributed locally

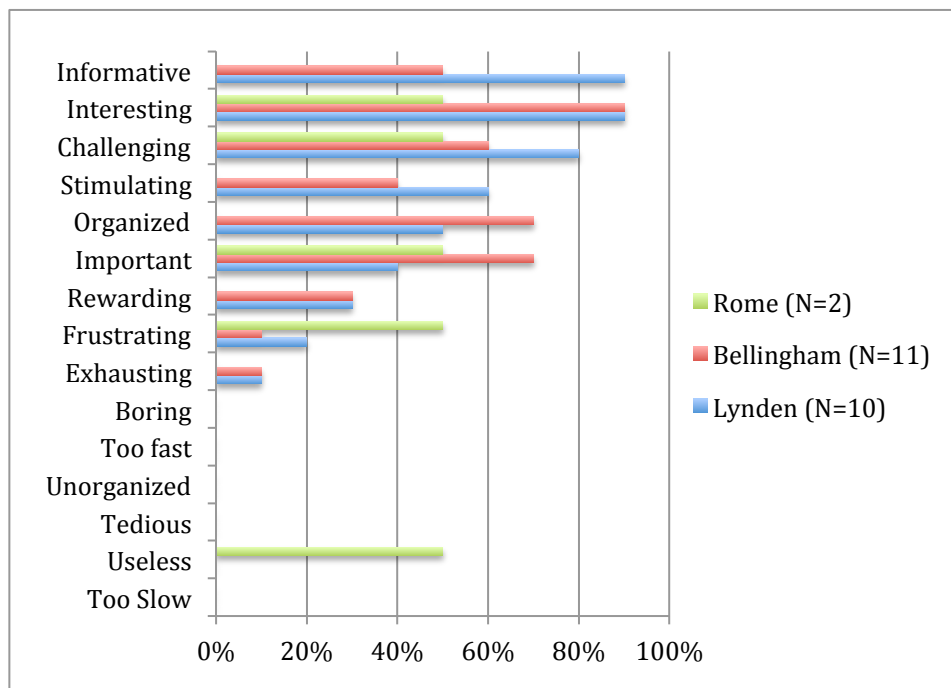
Appendix IV: Workshop Evaluations

We requested workshop participants to provide feedback about the indicator rating process. Below are the tallied results for those who replied.

1) On a scale of 1-10 (10 is high), please rate... (mean responses), N=23

	Lynden (N=10)	Rome (N=2)	Bellingham (N=11)	Average (N=23)
Importance of workshop	8.1	5.0	7.9	7.7
Ease of completing activities	7.2	4.5	7.1	6.9
Ability of workshop to help refine indicators	8.0	5.5	8.0	7.5
Quality of background Information	6.4	3.0	7.6	6.6
How well the workshop met expectations	8.4	5.0	9.0	8.3

2) From a list of 15 descriptors, please circle the ones that most describe your experience in this workshop:



Appendix V: Participant Comments on this Document

This document was sent by email to all interview and workshop participants. I received a few written comments, provided here.

1) "meticulous, well done, congrats"

2) "My comment is that Gov. is OUT OF CONTROL and I want no part of making it worse."

3) "One: Filtering the 300 initial proposed indicators down to ten percent for presentation at the workshops might have been driven by practical imitations (time, \$, etc.) of the study, but it seems a methodological flaw, in that the first sorts appear to have taken place outside of input by those surveyed, among other factors. At best, it appears to be premature narrowing of choices, especially significant because even if the discarded indicators weren't ultimately chosen, they might have stimulated thought when it came time for participants to suggest additional indicators. At worst, it appears to suggest an example of the cynic's view of planning, as a means of justifying predetermined conclusions. Thus, adding another appendix that lists all of the 300+ would be of benefit for future use of the study's results.

Two: While the use of opinion surveys as measures of psychological indicators seems reasonable, their use in areas such as governance seems otherwise, for several reasons. What people really feel is revealed by how they act far better than by how they respond to surveys -- the new Google technology notwithstanding. How people feel about gov't has little to do with how effective it really is, and that effectiveness measure is critical to evaluating governance, and certainly should be evaluated by other objective measures than rate of permit processing, as important as that factor is to some. Each of the governance indicators is hitting at an important aspect of that subject area, but need to be replaced with objective measures of the same items (trust, etc.) that are behavior-based.

Three: While the study overall is of great value as an analytical tool, the county should be cautioned not to take the final set of indicators in the study as the final result for HWB-E indicators. It's a good start, but more work needs to be done by the county before it will achieve an adequate threshold of public buy-in on any indicators it actually uses."