
ANALYZING HISTORICAL & CONTEMPORARY FISHERIES POLICY

A Science Literacy Unit: Student Packet



Overview

This course will investigate the challenges and opportunities created by Alaskans fisheries through an exploration of the combination of current management and traditional stewardship. Students will practice reading, writing, listening, and oratory strategies while developing an understanding for western and Tlingit science. This multi-week, seven-lesson unit focuses on the interdisciplinary study of the oral narratives, “Salmon Boy” and “Eagle Boy Harvest” to establish equity in science, math, and literacy. Students will learn fundamentals and relevant terminology in fish and wildlife issues in Southeast Alaska as they student fishing technology and gear, Pacific salmon habitats and life cycles, historical and contemporary fish and wildlife policy. The student will be challenged to assess their individual philosophies of fish and wildlife policy and programs as they engage in projects, case studies, field investigations, and research to answer the questions , “how should local knowledge influence future policies?”

Standards Addressed in this Unit

Themes (parallels AP Environmental Science Content as found at <http://apcentral.collegeboard.com/apc/public/repository/ap-environmental-science-course-description.pdf> and Juneau School Districts science content standards)

Science

1. Science as Inquiry and Process

- Science is a method of learning and constantly changes the way we understand the world
- SA1.1 Students ask questions, predict, observe, describe, measure, classify, make generalizations, analyze data, develop models, infer, and communicate
- SA1.2 Students recognize and analyze multiple explanations and models, use information to revise student's own explanation or model if necessary
- SA2.1 Evaluate credibility of cited sources when conducting the student's own scientific investigation
- SA3.1 Conducts research and communicates results to solve a problem

2. Energy conversions underlie all ecological processes

- Energy cannot be created; it must come from somewhere
- SC3.1 Relate carbon cycle to global climate change

c. The Earth itself is one interconnected system

- Biogeochemical and natural systems vary in ability to recover from disturbances
- SC3.2 Analyze potential impacts of changes

d. Humans alter natural systems

- Technology and population growth have enabled humans to increase both the rate and scale of their impact on the environment
- SD3.1 Describe causes, effects, preventions, and mitigations of human impact

e. Environmental problems have a cultural and social context

- Understanding the role of cultural, social, and economic factors is vital for solutions
- SE1.1 Research how social, economic, and political forces strongly influence which technology will be developed

f. Human survival depends on developing practices that will achieve sustainable systems

- A suitable combination of conservation and development is required
- SF1.1-SF3.1 Investigate the influences of societal and or cultural beliefs on science

Language Arts

a. The student restates/summarizes and connects information.

R4.2 Summarize information or ideas from a text and make connections between summarized information or sets of ideas and related topics or information

b. Student analyzes content of text to differentiate fact and opinion

R2.9 a. Differentiate between fact and opinion. b. Express opinions about text with support

c. Student connects and evaluates cultural influences/events.

R3.10 Compare and contrast how texts reflect historical and cultural influences.

R4.9 Analyze the effects of cultural and historical influences on texts.

Cultural Standards

A.2 Students will recount their own genealogy and family history

B.4 Identify appropriate forms of technology and their use for improving community

D.3 Interact with Elders in a loving and respectful way that demonstrates and appreciation of their role as culture-bearers and educators in the community

E.2 Understand the ecology and geography of the bioregion they inhabit

Unit Objectives:

As a result of this unit students will understand:

- As different cultures have opposing views about resource management, regulating fisheries is a controversial topic for our state
- Local policy makers, enforcement agencies, and enhancement hatcheries: Alaska Department of Fish & Game (ADF&G), National Oceanographic Atmospheric Association (NOAA), National Marine Fisheries Service (NMFS), and Douglas Island Pink and Chum, Incorporated (DIPAC, Inc), United States Fish and Wildlife Service (USFWS)
- The differences and similarities of traditional stewardship and current management
- Local ecosystems, habitat, life cycles, and human impacts that affect Pacific salmon

As a result of this unit students will be able to:

- Analyze and evaluate information related to Alaska fisheries and express ideas both in writing and orally.
- Examine how moving from an attitude of land stewardship to resource management has impacted Tlingit culture.
- Evaluate the value of functioning in a western world (literacy and advocacy) as well as counting to uphold tradition.

Tlingit Educational Significance

- Students benefit from listening to elders and cultural specialists. An elder or cultural specialist should be invited to tell *Salmon Boy & Eagle Boy* in their own words to ensure accuracy, clan proprietorship, and complexity of the oral narratives.
- Tlingit heritage language speakers can teach Tlingit vocabulary and phrases related to stewardship, management, coastal ecology, and other factors that influence fisheries.
- This unit will validate Tlingit understanding of the ecology and geography of the local bioregion and the significance of oral narratives for promoting ethics and responsibility.
- This unit will enable Alaska Native students to understand the Tlingit ingenuity of their ancestors and will help non-Native students better understand landscape ecology and cultural history.

Culminating Project or Event

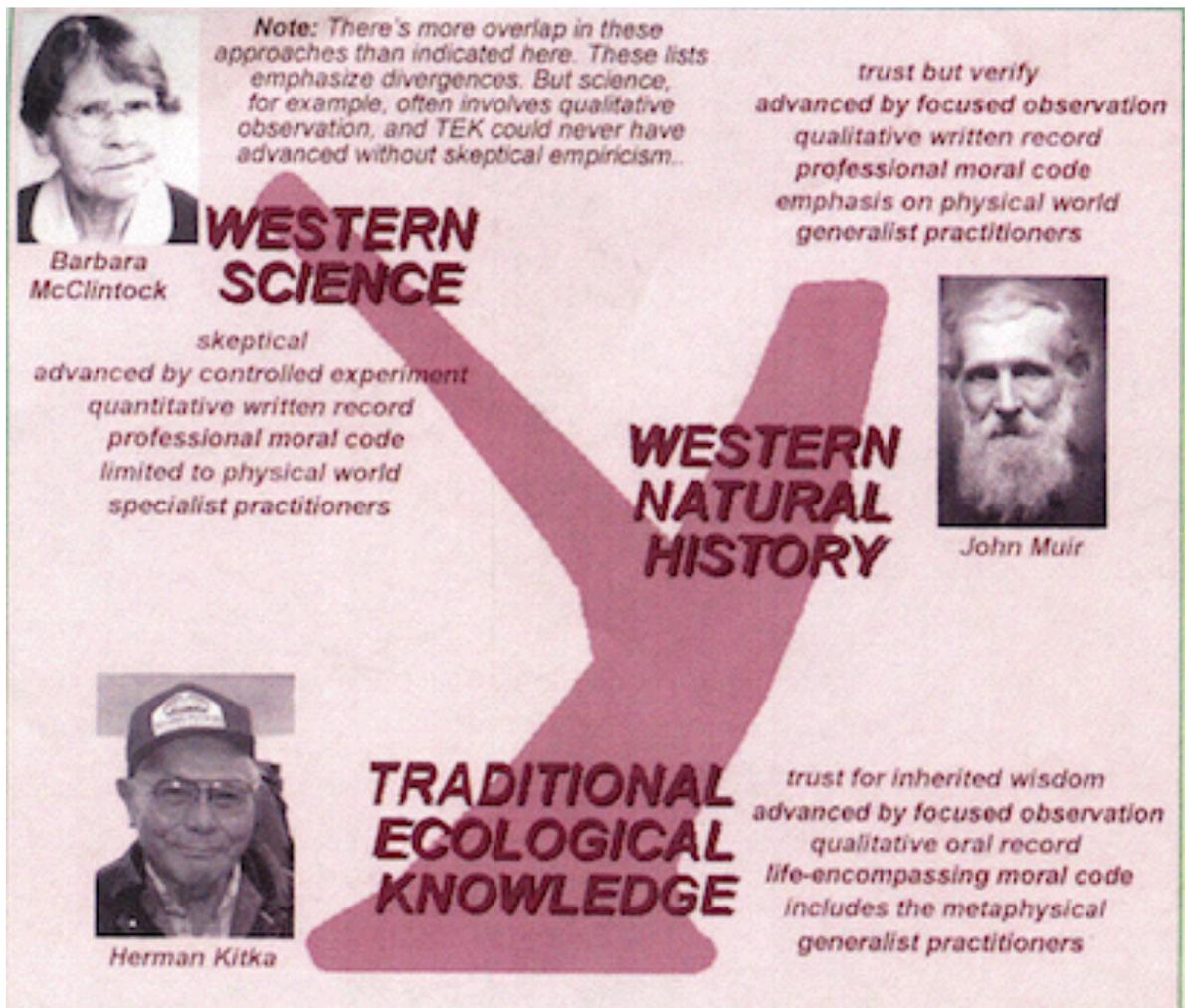
- Groups create co-management plan with accompanying outreach and education visuals (can be informational pamphlet, podcast, iMovie, or Garage Band productions if time and resources are available).
- Present visuals and plans to elders, cultural specialists, community professionals, and extended family members and offer them traditional food to thank them for their support in the classroom.

Supplemental Materials & Suggested Texts

This unit consists of project rubrics, concept maps, student worksheets, PowerPoints, and articles.

- Haa Shuká, Our Ancestors: Tlingit Oral Narratives. Nora Marks Dauenhauer and Richard Dauenhauer. 1987. Volume 1.
- Haa Atxaayí Haa Kusteeyíx Sitee, Our Food is Our Tlingit Way of Life. Excerpts from Oral Interviews. Richard G. Newton and Madonna L. Moss. USDA 3rd Edition.
- Alaska Native Science: A Curriculum Guide. Dr. Dolly Garza, the Alaska Native Knowledge Network. 2011.
- “Traditional Knowledge and Harvesting of Salmon by Huna and Hinyaa Tlingit” Final Report (102 pages of incredible information for use with this unit)

Overview of Lessons	Literacy Strategies	Academic Vocabulary	Assessments
<p>Lesson 1: Nature of Science <i>Science is a Process</i> Students explore the convergence of western and traditional science through guided reading, discussion, and reflection writing.</p> <ul style="list-style-type: none"> • Student Page: “Ways of Knowing” article • Student Page: “Western science & traditional knowledge” article 	<ul style="list-style-type: none"> • Guided writing • Quick-write • Think-Pair-Share • Mark the text • Paraphrasing 	<ul style="list-style-type: none"> • traditional ecological knowledge • western science • empiricism 	<ul style="list-style-type: none"> • Journal Prompt • Peer Reflections
<p>Lesson 2: Stewardship & Management <i>Science is a Process</i> Students practice problem-solving strategies as they create graphic representations of abstract concepts regarding historical and contemporary fishery policy.</p> <ul style="list-style-type: none"> • Student Page: What is an oral narrative? • Student Page: Copy of <i>Eagle Boy Harvest</i> • Student Page: Stewardship & Management Table 	<ul style="list-style-type: none"> • Graphic representation • Generating questions • Annotations • Quick-write • Paraphrasing 	<ul style="list-style-type: none"> • oral narrative • cultural context • permits • regulations • enforcement • stewardship • management 	<ul style="list-style-type: none"> • Article summary & annotation (peer review) • Class Venn Diagram • Table
<p>Lesson 3: Co-management Introduction <i>Humans alter natural processes</i> Students are introduced to the unit’s culminating activity expectations to use the problem-solving strategy of working backwards to find the answer.</p> <ul style="list-style-type: none"> • Student Page: Aak’w Kwáan & Taak’u Kwáan Map • Student Page: Final project scoring guide 	<ul style="list-style-type: none"> • Note-taking • Generating questions • Debriefing • Quick-write • Work backward • Graphic Representation 	<ul style="list-style-type: none"> • co-management • conservation/management plans • local resources 	<ul style="list-style-type: none"> • Table • Journal Prompt
<p>Lesson 4: Run & Abundance <i>Humans alter natural processes</i> Students make predictions, run a simulation, generate questions, and discuss the challenges of estimating stock abundance of Pacific salmon.</p> <ul style="list-style-type: none"> • Student Page: Predicting Uncertainty Table 	<ul style="list-style-type: none"> • Note-taking • Generating questions • Discussion group • Graphic Representation 	<ul style="list-style-type: none"> • population dynamics • fecundity • run • recruitment • escapement • abundance 	<ul style="list-style-type: none"> • Table
<p>Lesson 5: Salmon in the Trees <i>The Earth is one interconnected system</i> Students explore the concept of keystone species and the energy transfer of the different components of ecosystems through the combination of Tlingit oral narratives and academic journals. Students will work together to identify key components of local coastal food webs through stream quality testing.</p> <ul style="list-style-type: none"> • Student Page: Copy of <i>Salmon Boy-Moldy End</i> • Student Page: Storyboard • Student Page: Free Response Quiz • Student Page: Fish Policy PowerPoint • Student Page: Excerpts from TEK & Fishery Article 	<ul style="list-style-type: none"> • Quick-write • Think-Pair-Share • Mark the Text • Oral Reading • Note-taking • Paraphrasing 	<ul style="list-style-type: none"> • water quality • dissolved oxygen • pH • fishing gear • fermentation • food preservation 	<ul style="list-style-type: none"> • Free Response Quiz • Article Summary
<p>Lesson 6: TEK in Research <i>Human survival depends on sustainable practices</i> Students will demonstrate understanding of the importance of ancient knowledge in today’s changing world as they prepare for the final presentation.</p> <ul style="list-style-type: none"> • Student Page: Interview Template (Short Project) • Student Page: Anadromous Waters Catalog (GIS) 	<ul style="list-style-type: none"> • Think-Pair-Share • Note-taking • Work backwards 	<ul style="list-style-type: none"> • Geographical Information System (GIS) • Anadromous 	<ul style="list-style-type: none"> • Interview • Final project prep
<p>Lesson 7: Sharing Our Ideas <i>Science is a Process</i></p> <ul style="list-style-type: none"> • Student Page: Final presentation 	<ul style="list-style-type: none"> • Graphic representation • Paraphrasing 	<ul style="list-style-type: none"> • respect 	<ul style="list-style-type: none"> • Final project



WAYS OF KNOWING

In recent years, there have been many attempts to explore the similarities and differences between traditional Ecological Knowledge (TEK) and Western Science (WS), mostly in an attempt to reconcile these sometimes diverging world views, and to arrive at ways for each to respectfully inform the other.

Here, we introduce a third element to the dichotomy between WE and TEK-the discipline of Natural History (NH), as exemplified by naturalists such as John Muir. over time, as WS has taken over the role of original research, naturalists have tended to move into the role of interpreters, synthesizing and community the findings of scientists to the public.

In the graphic above we present the relationships between TEK, NH, and WS as a tree. Position on this tree-crown vs roots, etc-is not intended to signify superiority of one over the other. But a progression over time is suggested. Our challenge is to be sure the roots of the three don't wither as the branches proliferate.

Examining the attributes of these 3 approaches to knowledge, we suggest that old-style Natural History

and TEK may be more closely related to each other than either is to WS. Today's naturalist may use GPS and digital photography, but philosophically, s/he may be closer to the root than the crown of the tree. The naturalist and the Tlingit hunger or spruce-root gatherer are generalists, whereas the scientist is increasingly specialized. Although the discipline of natural history is not bound to a life-encompassing moral code or spirituality, many individual naturalists are deeply spiritual. John Muir saw in nature the expression of God. With science, the advancement of knowledge becomes more formalized. In its strictest definition, science involves hypothesis generation, followed by rigorous, quantitative experimentation. Because skepticism is at the core of this testing, science distance itself from the metaphysical (i.e. the untestable). Of course, individual scientists may be religious, but most would claim that their untestable beliefs are not permeated to bias their scientific objectivity.

In science, except for professional ethics, there is no right or wrong-only the incremental pursuit of truth, mostly through hypothesis generation. Scientists don't hope to *arrive* at the ultimate Truth; they're more interested in chipping away at truth with a small "t."

By: Richard Carstensen of Discovery Southeast

Western science and traditional knowledge

Despite their variations, different forms of knowledge can learn from each other

Fulvio Mazzocchi

Cultures from all over the world have developed different views of nature throughout human history. Many of them are rooted in traditional systems of beliefs, which indigenous people use to understand and interpret their biophysical environment (Iaccarino, 2003). These systems of managing the environment constitute an integral part of the cultural identity and social integrity of many indigenous populations. At the same time, their knowledge embodies a wealth of wisdom and experience of nature gained over millennia from direct observations, and transmitted—most often orally—over generations.

The importance of this traditional knowledge for the protection of biodiversity and the achievement of sustainable development is slowly being recognized internationally (Gadgil *et al*, 1993). For example, Article 8 of the Convention on Biological Diversity urges us to “...respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity...” (United Nations, 1992). In addition, traditional or indigenous knowledge has been rediscovered as a model for a healthy interaction with, and use of, the environment, and as a rich source to be tapped into in order to gain new perspectives about the relationship between humans and nature.

However, our difficulty in approaching the knowledge from indigenous cultures is already reflected in the way in which we describe and name it. No universal definition is available, and many terms are used to establish what indigenous people know (Berkes, 1993), including traditional knowledge or traditional ecological knowledge, local knowledge, indigenous knowledge or science, folk knowledge, farmers’ knowledge, fishers’ knowledge and tacit knowledge. Each of these terms carries different implications, and there is an ensuing discussion about which one is the most appropriate. The word ‘traditional’, for example, places the emphasis on the transmission of knowledge along a cultural continuity, but might ignore the ability of traditional societies to adapt to changing circumstances. Another widely used word, ‘indigenous’, is meant to highlight the autochthonous nature of this knowledge, but it might overlook knowledge from populations who are not officially recognized as indigenous. The word ‘local’ can be applied to different geographic contexts, but it lacks specificity. At present, traditional ecological knowledge is interpreted as a cumulative body of knowledge, practices and representations that describes the relationships of living beings with one another and with their physical environment, which evolved by adaptive processes and has been handed down through generations by cultural transmission (Berkes *et al*, 2000).

Many indigenous populations have relied for centuries or even millennia on their direct environment for subsistence and autonomy. Over time, they have developed a way in which to manage and use their resources that ensures their conservation into the future. Such traditional societies are interested more in preserving their own social, cultural and environmental stability and integrity than in maximizing production. Consequently, there is no ‘exploitation’ of nature—which they do not consider as a collection of commodities—in the interaction between humans and natural milieu. On the contrary, their way of life is based on a strong sense of

interconnection and interdependence. This also applies to their social life. Ethics is explicitly part of the traditional approach. Relationships are based on reciprocity and obligations towards community members. Natural resource management is based on shared meanings and knowledge (Berkes, 1993). Activities in traditional societies often include a strong symbolic dimension in which every action is highly ritualized, and allow humans to participate in the preservation of the natural order. Of course, these rituals differ between cultures, as each society has its own belief systems, which determine its cultural identity and type of technology.

Traditional knowledge has developed a concept of the environment that emphasizes the symbiotic character of humans and nature. It offers an approach to local development that is based on co-evolution with the environment, and on respecting the carrying capacity of ecosystems. This knowledge—based on long-term empirical observations adapted to local conditions—ensures a sound use and control of the environment, and enables indigenous people to adapt to environmental changes. Moreover, it supplies much of the world's population with the principal means to fulfill their basic needs, and forms the basis for decisions and strategies in many practical aspects, including interpretation of meteorological phenomena, medical treatment, water management, production of clothing, navigation, agriculture and husbandry, hunting and fishing, and biological classification systems (Nakashima & Roué, 2002). Beyond its obvious benefit for the people who rely on this knowledge, it might provide humanity as a whole with new biological and ecological insights; it has potential value for the management of natural resources, and might be useful in conservation education as well as in development planning and environmental assessment (The World Conservation Union, 1986).

Of course, I am not trying to assert the ideal of the 'noble savage'. Not all indigenous people have lived or are living in peace and harmony with nature; history has seen many cultures disappear after they had exhausted the environment's ability to sustain their population, such as the Maya or the Anasazi in the Americas. However, many existing traditional practices are ecologically healthy, and we cannot simply dismiss them as primitive and unscientific belief systems.

In all cultures, humans have gained knowledge by conceptualizing empirical observations to better understand nature, and thus interpret and predict it (Iaccarino, 2003). The problem is how to study and analyze indigenous knowledge and belief systems. Of course, we cannot depend only on their empirical aspects, but must embrace their specific world views. It is not possible to simply reduce them to practical knowledge that is exclusively based on experience as opposed to theoretical knowledge, which is developed through deductive or inductive reasoning. In any case, discovering the fundamental principles of dealing with nature in many far-off cultures is not an easy task. Western science—which is deeply rooted both in the philosophy of Ancient Greece and the Renaissance—and traditional knowledge systems have developed radically different strategies to create and transmit knowledge, and it is exceedingly difficult to analyze one form of knowledge using the criteria of another tradition.

Still, there is a vast body of literature on such comparisons between Western science and traditional knowledge systems, which has identified various characteristics and opposing views. Western science favours analytical and reductionist methods as opposed to the more intuitive and holistic view often found in traditional knowledge. Western science is positivist and materialist in contrast to traditional knowledge, which is spiritual and does not make distinctions between empirical and sacred (Nakashima & Roué, 2002). Western science is objective and quantitative as opposed to traditional knowledge, which is mainly subjective and qualitative. Western science is based on an academic and literate transmission, while traditional

knowledge is often passed on orally from one generation to the next by the elders. Western science isolates its objects of study from their vital context by putting them in simplified and controllable experimental environments—which also means that scientists separate themselves from nature, the object of their studies; by contrast, traditional knowledge always depends on its context and particular local conditions (Nakashima & Roué, 2002).

In general, traditional knowledge systems adopt a more holistic approach, and do not separate observations into different disciplines as does Western science (Iaccarino, 2003). Moreover, traditional knowledge systems do not interpret reality on the basis of a linear conception of cause and effect, but rather as a world made up of constantly forming multidimensional cycles in which all elements are part of an entangled and complex web of interactions (Freeman, 1992). Of course, there is always the risk of oversimplifying by reducing the things of interest to essentials and/or dichotomies. However, from this brief overview of the dissimilarities, we can gain an understanding of how hard it is to compare two systems of knowledge that are so profoundly different. Trying to analyze and validate traditional knowledge systems by using external (scientific) criteria carries the risk of distorting such systems in the process. At the same time, we cannot extract just those parts of traditional knowledge that seem to measure up to scientific criteria and ignore the rest. This process of cognitive mining would atomize the overall system and threaten traditional knowledge with dispossession (Nakashima & Roué, 2002).

However, Western contemporary culture and philosophy does offer some interesting ideas as to how to deal with these problems. The Austrian-born philosopher Paul Feyerabend, for example, questioned the widespread assumption that only Western science holds the criteria to determine the truth. As Feyerabend pointed out, any form of knowledge makes sense only within its own cultural context (Feyerabend, 1987). Similarly, the British anthropologist Gregory Bateson has compared knowledge about the material world to a map and the terrain it describes: the map itself is not the terrain, but only one representation of it (Bateson, 1979). Just as different maps can give accounts of the same territory, so too can different forms of knowledge about the material world. Its actual representation ultimately depends on the observer's view.

Contemporary hermeneutics—a branch of philosophy concerned with the theory of existential understanding and interpretation of texts—and, to a certain extent, complex thinking can offer useful approaches to compare different forms of knowledge and rationality. Complex thinking has provided new insights, and has contributed to a renewed interpretation of the concept of nature, and a new paradigm of science and epistemology. This new approach has brought a greater awareness of the shortcomings of simple explanations in comprehending reality. It aims to overcome the limits of both reductionism and holism by integrating them into a wider perspective, which investigates the complex structure of interconnections and retroactive relationships in the real world.

According to the classic epistemological approach, the creation of knowledge is a process of qualitative refinement and quantitative accumulation. Its goal is to disclose the ultimate foundation—the 'meta' point of view from where we can see the ontological order and the objective truth—and to provide a neutral and universal language to explain natural phenomena (Ceruti, 1986).

Complex thinking has strongly questioned this notion of a meta point of view along with its heuristic value as a principle for the creation of knowledge. Instead, it seeks and analyses the web of relationships among different perspectives. This is continually redefined in a dynamic

process involving multiple points of observation and explanation. These places are fundamentally incommensurable, yet they can complement each other and be part of a constructive network. What matters, in fact, is the possibility of including multiple viewpoints that are vicarious in building a cognitive universe and can disclose a more complete picture of reality.

In this context, the hermeneutical notion of a ‘horizon’ as expressed by the German philosopher Hans-Georg Gadamer seems to be highly relevant: “Horizon is the range of vision that includes everything that can be seen from a particular vantage point” (Gadamer, 1960). Rationality intrinsically works from this point, which starts the process of comprehension through which we can interact with other and different horizons, and ultimately expand our own knowledge horizon.

The encounter between different cultures and knowledge systems can then be regarded as an encounter between different macrohorizons; such systems come from different traditions, and each has its own way of understanding phenomena and its own ‘logic’ that allows the observed phenomena to be placed within an overall vision. Nevertheless, all representations of reality are expressions of the same cognitive features that are inherent in human nature.

Traditional environmental knowledge is an important part of humankind’s cultural heritage—the result of countless civilizations and traditions that have emerged over human history. This cultural diversity is as important for our future as is biodiversity. It is a potential source of creativity and enrichment embodied in several social and cultural identities, each of which expresses its uniqueness (United Nations Educational, Scientific and Cultural Organization, 2002). However, European colonization has eroded and destroyed much of this traditional knowledge by replacing it with Western educational and cultural systems. The trend towards a global culture might even worsen this situation and enhance a process of cultural homogenization.

Scientific knowledge has long held a central role and attained a dominant position in our developed societies, but we cannot ignore the fact that other valid knowledge systems exist. The imposition of Western scientific ideas and methods not only causes disruption to existing social and economic relationships, but also might spoil the local knowledge. Allowing science to be the final arbiter of the validity of knowledge, and to establish the threshold beyond which knowledge is not worthy of its name, would create the conditions whereby an astonishing cultural heritage is transformed into a monolithic structure. Instead, we would be better advised to recognize the value of this heritage, and to devise strategies for its preservation for the benefit of present and future generations.

First, a renewed approach to dialogue among cultures is required. Such a dialogue can only take place if there is a common principle shared by all participants. All humans from all cultural backgrounds have the same biological nature. At the same time, however, a dialogue is only possible because there is diversity at various levels. Eliminating these differences or staying in rigid isolation eliminates the conditions needed for a potentially mutually beneficial converse.

By acknowledging the uniqueness of each knowledge system, we can go well beyond a mere pluralist approach to knowledge. Dialogue can become a tool for social cohabitation, as well as for discovering and enhancing knowledge. It should be based on a sense of profound hospitality because it arises from different identities and traditions, which are interested in exchanging their perspectives and experiences. This should not be anathema to Western science—in fact, it is through dialogue that new insights have emerged from the ancient Greek academies to today’s laboratory meetings and scientific conferences. In this sense, a dialogue

can catalyse the development of shared meanings, which are key factors in binding people and societies together as vehicles of social cohabitation (Bohm, 1996).

The real world is too complex to be compressed into static conceptualizations. Dealing with this complexity requires approaches and strategies that maintain a continuous openness and willingness to discover and learn (Morin, 1990). This dialogue should take place with the unknown and the otherness. By shifting our perspective, and looking at other paths to knowledge that humans have developed and lived, we might create the necessary conditions for hitherto unknown knowledge to be revealed. All of these perspectives describe the human experience of reality. We need to open ourselves to participating in the experience of others, and yet we should also be aware that this opening can only start from where we already are—from our point of view or the tradition to which we belong. Our historical and culturally embedded perspective has been described by Gadamer as the “initial directedness of our whole ability to experience” (Gadamer, 1967). Nevertheless, from our delimited horizon we can still accept the invitation of other paths to knowledge and might well learn from them.

For example, some authors (Freeman, 1992; Iaccarino, 2003) have suggested that traditional knowledge systems can be helpful in dealing with complex systems: “The understanding of complex systems remains a major challenge for the future, and no scientist today can claim that we have at hand the appropriate methods with which to achieve this. Thus, we cannot discuss the future of science without taking into account the philosophical problems generated by the study of complexity. Modern, or Western, science may not be best suited to fulfill this task, as its view of the world is too constrained by its characteristic empirical and analytical approach that, in the past, made it so successful. We should therefore remember the contributions of other civilizations to the understanding of nature. [...] Such traditional or indigenous knowledge is now increasingly being used not only with the aim of finding new drugs, but also to derive new concepts that may help us to reconcile empiricism and science” (Iaccarino, 2003).

There is little doubt that modern science can gain a lot from such a dialogue. It has been extremely efficient in studying specific aspects of the natural world—those that are achievable through observation and experimentation—but operates in an environment that is either strictly controlled, such as a laboratory, or highly simplified. This approach is crucial in order to make generalized claims about the validity of scientific propositions, because it allows hypotheses under the same or highly controlled conditions to be tested and verified. However, an increasing number of critical voices argue that an approach based on reductionism—as helpful as it has been in the past—might no longer be sufficient to analyze and understand higher levels of complexity (Kellenberger, 2004; van Regenmortel, 2004). Moreover, scientists work only at specific levels of analysis. The theories formulated at each level are based on key observations, and, therefore, can explain only a specific set of facts (Iaccarino, 2003). Hence, the integration of methods and results from different approaches and levels of analysis can become essential.

These considerations seem to be particularly relevant for studying biological, ecological and social phenomena that include different levels of complexity. As already mentioned, the Western tradition of thinking is developing a different approach to gaining knowledge from complex systems, but it would be equally useful to learn how traditional approaches explain such complexity. Not only are they more holistic, but also they seem to be better suited to coping with the uncertainty and unpredictability that are viewed as intrinsic characteristics of natural systems. Western science and traditional knowledge constitute different paths to knowledge, but they are rooted in the same reality. We can only gain from paying attention to our cultural history and richness.

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What is an Oral Narrative?

Tlingit oral narratives contain many layers which enrich our knowledge and imagination. On one level, these stories are great entertainment. Some Tlingit narratives explain how aspects of our world came to be. Other oral narratives relate epic adventures of specific clan ancestors. Stories involving Raven often include humorous exploits which may lead us to reflect upon respectful treatment of others. However, oral narratives were not told solely for entertainment.

Many oral narratives have been written down. Some are written down exactly as they are told and therefore sound like the storyteller. Others have been changed over time to sound more like stories. Oral narratives are best when you can see and hear the storyteller who can make an oral narrative come to life.

In the past, oral narratives were used to convey many forms of knowledge. Oral narratives teach about place names, property, geography, and science. From these stories, younger generations would learn about food preparation, the ebb and flow of the tides, and behavioral patterns of hunted mammals. Many of these stories assisted in the teaching of life skills such as navigation and obtaining food from the land. In addition, oral narratives were used to convey traditional values and social responsibility: They explore human nature and may involve concepts of identity, alienation and isolation, coming of age, loyalty, pride, loss, and other conflicts humans experience throughout life. These stories are spiritual, intellectual gifts which have been passed down from esteemed ancestors. Like all good literature, Tlingit oral narratives can be used to enhance content learning in the classroom. These stories can be used as a springboard to teach history, geography, science, mathematics, Tlingit heritage language, reading, writing, and more.

The Gift of Tlingit Stories

When you hear a Tlingit story it is a gift. You may be hearing a story that does not belong to you. This story may be over one thousand years old. The story might even tell about the history of the clan who owns it. Be sure to show respect for this gift. Listen with your heart and show appreciation for the story teller.

Types of Tlingit Stories

- ❖ Oral Narratives
- ❖ Songs
- ❖ Dances
- ❖ Totem Poles

Paraphrase in your own words the significance of oral narratives:

Note: Tlingit oral narratives are the property of specific clans. Many stories require permission before they are shared.

The Eagle Boy Harvest story this unit refers to is from the Haa Atxaayí Haa Kusteeyíx Sitee, Our Food is Our Tlingit Way of Life (pages 32-34) as compiled by Richard G. Newton and Madonna L. Moss and as told by John C. Jackson of Kake. The story is property of the Wooshkeetaan clan of Aak'w Kwáan.

“This is the story of an orphan boy. Eagles build their houses in trees; people call them eagle nests because in the eyes of human beings it is a nest. To the eagles it is a house and a home.”

There was a young boy who became an orphan. His father and mother died, all his uncles also. He had only one pair of grandfolks still living. They were quite old and not able to get around, but they were his only living relatives, so they looked after him. As he grew old enough he was able to get around and he realized he would have to do something for them because they were so old. If they were going to eat, he would have to get some food. So one of the first things he did was to look around. Out in the vicinity of Auke Village there was a reef. While rowing around there one day he discovered there was food there and he gathered some up and brought it ashore. His grandfolks thought this was wonderful, so in turn, they told him to be very careful. They instructed him to always tie the rope around his waist, which he did religiously.

One day the leather used for rope somehow untied itself from the bow of the boat. The other end was still attached to his waist. When he discovered the canoe had floated quite a ways from him, he did not know what to do. He was a small boy and did what was natural for a boy. He hollered for help and when he did not see any response he cried. After he stopped crying he stood there and thought. The tide would soon come up, so he began to gather rocks and pile them up one at a time. He made steps so that as the tide came up he would be able to climb to the top of the pile and stay above the water. This he did.

All of a sudden he heard a strange noised coming from above him. It was a commotion made by the noise of wings. When he looked up he saw a large eagle descending on him with its claws extended and ready to pick him up. He could not believe it when his feet left the ground but he did not put up any resistance.

The eagle finally let him down gently in front of what was to be his eagle family home. One of the eagles noticed this strange creature on their premises so right away he opened the door and asked very loudly “what is this human being doing in our yard?” He overheard the conversation in Tlingit. The eagle said to his father, “this is a human being I saved from drowning out on one of the reefs out there. The tide was overtaking him, do not harm him. Let me say that again, **do not harm him!**” He stayed in the eagle community for years. He was well provided for with food, it was like living at home.

From all appearances the eagle that saved the boy looked like an attractive young woman. Finally she spoke to her father saying, “he is my future husband, I want you to know this.” This future wife of his talked with him at great length and gave him much advice. She asked him, “do you see the shirts that are hung on the wall? They all have power...but in varied degrees.” She pointed to the sixth shirt and said, “that is the best one. It is the one with the most power...and it is called Ka.aan galshaat. My father is going to give you a gift. If he gives you a choice, make sure and choose Ka.aan galshaat.” This is literally translated to mean lifting a whole town. Then she went on to say this is why, when an eagle gets its talons into its prey...it stays.

One day not long after, her father said, “I want to give you a gift.” He showed him the shirts on the wall and said “yo are to choose on of the shirts that you see on the wall.” The boy did not waste any time saying, “I will take that sixth shirt.” Then the wise eagle father said, “that shirt is Ka.aan galshaat. The fourth and the third shirts do not have that much power but it is good for you not to have too much power at the very beginning. You would make a mess of it if you had too much power to work with before you had any experience. That is why I will give you the third shirt; you will be able to see with keen mind and eye, your prey approaching the surface of the water. This will be give to you

first of all. The eagle *kwáan* will bestow fortune upon you through my daughter. I want you to try out this third shirt and see what you can do.”

He put the shirt on and went up on top of a high tree. He could see many, many things as clear as could be. He saw a fish come to the surface so he went out. His father-in-law told him, “now you just do not fly any old way, you fly the way the sun rises and sets, east to west. Do not forget this.” So he picked his prey up, which was a black bass.

The second day he repeated the same ordeal of going up in the tree and looking around. When he saw an object coming to the surface he was all prepared for it, he had it timed so that just when he got to it, it was coming to the surface so he picked it up and brought it home. There he put it in front of his future father-in-law. It was a red snapper. The third day he went out and got a gray cod and brought it home.

The following day he went out and saw a hair seal and got his talons on it and this particular time the seal got away. So he went home and told his tale of woe about losing his kill. He said I lost it because I was not strong enough. So his father-in-law gave him the fourth shirt.

He went out and caught the same seal and there was nothing to it. He caught a porpoise the following day and towed it ashore. He came across the same problem though later on when he lost a sea lion because he could not hang on to it. So his father-in-law gave him the final shirt and also a lecture about what a valuable shirt it had been for the many, many years it had been handed down. It had been handed down from generation to generation and people had become wealthy as a result of these shirts. “No doubt if you are obedient and ambitious and work hard you will be able to become one of the wealthy people. Now I have one word of caution. Try and keep greed out of this. Do not overkill. Kill only one at a time.”

So he went out and made his first kill which was a sea lion. He towed it ashore. He caught many things and became a wealthy man and just before he retired, he thought to himself, “well, I will go out for the last time.” He caught a whale and looked around and saw another one very close by. He decided to kill that one also. He closed the two holes where it breathes on top and by doing that he was able to get the air in there and get them to float. During the night he towed them both ashore, just barely making it. He was about to make the last stroke when the raven crowed and the young man died.

Eagle Boy StoryBoard-As Told by John Jackson (Originally from the *Wooshkeetaan* clan of the Aak'w Kwáan. Story transcribed from tapes in *Haa Atxaayi Haa Kusteeyix Sitee, Our Food is Our Tlingit Way of Life.*)

Name: _____

After reading the story about “Eagle Boy” on page 32-34, compare and contrast current management of resources with traditional stewardship. Search for quotes in the oral narrative that address stewardship of resources and copy them into Column 1. In the second column paraphrase the action indicated by the quote. Next, insert one of the following components of contemporary management (**permits**, consequences, monitoring, enforcement, regulations/laws). Finally, in the last column, summarize how the two methodologies are connected.

TRADITIONAL STEWARDSHIP & CONTEMPORARY MANAGEMENT <i>Eagle Boy Story</i>			
Quote	Traditional Stewardship	Contemporary Management	How Are They Connected?
<i>Example: One day not long after, her father said, “I want to give you a gift.” He showed him the shirts on the wall and said “you are to choose one of the shirts that you see on the wall.”</i>	Example: Hunting privilege given by Eagle Father	Example: Permits Have to apply for fishing & hunting licenses	Example: Hunting is a privilege or responsibility to be earned

<p style="text-align: center;">Final Project Rubric: <i>Co-management Plan (including Outreach & Education Visuals)</i></p>	<p>Name:</p> <p>Group Members:</p>	
<p>Grading Criterion (3 points/each)</p>	<p>No</p>	<p>Yes</p>
<p>Preparation: Student utilized regulation guidelines and project rubric to organize & plan their work.</p>		
<p>Focus on Task: Used time well, focused on the project, worked well with others.</p>		
<p>Essential Question: Created an original, interesting way to address the essential question in their presentation.</p>		
<p>Audience Awareness: Design, vocabulary, audio, and graphics fit target audience</p>		
<p>Voice Consistency: Voice quality is clear and audible throughout the presentation</p>		
<p>Voice Pacing: The pace fits the information presented and draws the audience into the story.</p>		
<p>Narration: Each member narrates a section within the presentation. Tlingit and English names of resources are given.</p>		
<p>Imagery: Appropriate use of images for education and outreach visuals.</p>		
<p>Detail: Presentation has exactly the right amount of detail-not too short or too long.</p>		
<p>Purpose: Establishes purpose early and maintains that focus throughout.</p>		
<p>Duration: Group presentation is between 3 to 5 minutes in length.</p>		
<p>Requirements: Product includes all required elements.</p>		
<p>Total Points (36 points available):</p>		

Predicting with Uncertainty

*Full-detailed lesson from Dr. Dolly Garza's Alaska Native Science: A Curriculum Guide
(pages 27-49)

Write hypothesis: _____

Group Members:				
	# of Green Beans	# of White Beans	% of Green	Overall % Green
draw 1:				
draw 2:				
draw 3:				
draw 4:				
draw 5:				
Total:				
____ green out of 50 => ____ out of 10 (how does this match your hypothesis?)				

Rewrite hypothesis: _____

Group Members:				
	# of Green Beans	# of White Beans	% of Green	Overall % Green
draw 1:				
draw 2:				
draw 3:				
draw 4:				
draw 5:				
Total:				
____ green out of 50 => ____ out of 10 (how does this match your hypothesis?)				

The Salmon Boy or “Moldy-End” story this unit refers to is from the Dr. Dolly Garza’s Alaska Native Science: A Curriculum Guide (page 71) as told by Andrew P. Johnson, 1975.

The Kiks.ádi were drying their salmon. After they had gotten through drying it they tied it up. Nearby a small boy was bating a snare for seagulls. He came into the house very hungry. “Mother, I am hungry. Can I have some dried salmon.” So she gave him a piece of dried salmon which had begun to mold in the corner. Then he said, “How come you always give me moldy-cornered ones, they’re not as good!”

Just then someone shouted out, “There is a seagull in your snare.” So he ran down to the water to his snare. When he got to the snare he was pulled down into the ocean. The people began hunting for him, but he was nowhere to be seen. It was not known what happened to him.

It was the salmon people that had done it, they went out to sea with him. They went seaward with him toward their homes. To him it looked as if they were in a canoe. A chief among these salmon had made him his son. He was among them for one year.

The salmon people all knew the salmon month had come up here which was their month for returning. They always spawn up here among us. They started back with him.

Now they saw his father coming down from up the creek. They said to the boy, “Stand up.” He jumped up. “Very fin,” said his mother. His mother called him a fine salmon. After that the salmon swam up the creek.

The salmon tribe shouted “Go to your mother.” His mother was cutting salmon on the beach. Then she called her husband’s attention to it. “A fine salmon is swimming here with its head out.” His father took up a hook, for he did not know that it was his son.

At once he swam out in front of his father. When the father had hooked it he pulled it out on a sandy bar. He hit it on the head in order to keep it fresh. Then he threw it to his wife. “Cut it up. We will cook it.” So she put the salmon down to cut it up in the usual manner.

The Tlingit obtained copper in ancient times. A chain of twisted copper was around the salmon’s gills, for he had gone into the water with it on. She had tried to cut around the gills but her knife hit metal. Then she called out to her husband, “Come here.” They began to examine it and found the copper that hung around her son’s neck.

As soon as he saw this he threw the fish into a finely woven basket. He spit upon it and blew eagle’s down onto it. Then he put the basket enclosing the salmon on the roof of the house. Toward morning there was a noise inside it. The boy’s spirit began to work inside of it. At daybreak he went up to look at it, and his son lay where the salmon had been.

The sea gull which he had tried to snare had become his spirit. The son showed his people how to respect the salmon and to not waste even the moldy ends.

FREE RESPONSE

There is a coastal year-round nestled in a protected cove surrounded by steep, high mountains in Southeast Alaska. There are many other beings this community interacts with in the surrounding area including herring, salmon, ptarmigan, clams, mountain goat, and seal. Community members respect the brown bear by traveling to a nearby seasonal site each summer to prepare food. Cedar and spruce trees offer shelter, weaving, and building materials. When picking the site, villagers paid close attention to risks such as avalanche zones and ensured visibility of the channel. The community is thriving and doubles their population 50 to 100 families as clans from neighboring areas intermarry.

Other people nearby in a new city noticed the great herring and salmon runs near this community site and start to bring their boats out to the cove to fish and bring home food to their families. These people fish differently with nets capable of catching fish by the tons. The families in the city have plenty of food and their population starts to grow fast. The villagers notice that there are less fish each year, and start to think about what might be causing the change by observing what they see and remembering stories from the past. The community members discuss the necessary permissions of taking fish from clan protected waters with the folks from the city, but the over harvesting continues. Some people are moving to the community cove to be closer to the fishing and using the nearby trees to make their homes. Both groups of people have the same needs: food, water, shelter, and space. What will happen to all of the people, animals, and vegetation?

(2013 AP Environmental Science Free-Response Question-modified)

- 1.** *Biological diversity, or biodiversity, has become a topic of great concern among conservationists. Biodiversity is often used by scientists and policy makers to help determine the health of ecosystems. Write a free-response (short essay) to answer the following questions.*
 - A.** *What abiotic and biotic factors influence the community site.*
 - B.** *Describe TWO characteristics shared by ecosystems that have high biodiversity.*
 - C.** *identify TWO specific human activities that result in a loss of biodiversity, and **explain** how each activity lowers biodiversity.*
 - D.** *For each human activity you discussed in C, **propose** a practical strategy (other than simply banning the activity) to reduce the loss of biodiversity.*
 - E.** ***Describe** ONE naturally occurring factor that could lead to a change (loss or gain) in biodiversity.*
 - F.** ***Describe** TWO ecological benefits that greater biodiversity provides.*

Traditional Ecological Knowledge of Tlingit People Concerning the Sockeye Salmon Fishery of the Dry Bay Area

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Abstract

The Yakutat Tlingit Tribe and the National Park Service have collaborated to document Tlingit traditional ecological knowledge about salmon ecology and fisheries management in the Dry Bay/Alsek River Delta. Historically Northwest Coast Peoples including Tlingit have managed fishing and fish populations. Each Tlingit clan or house managed and controlled specific rivers or in larger river's sections of rivers in southeast Alaska. Traditional beliefs about reincarnation of animal spirits and a kinship with animals contributed to how Tlingit traditionally treated and handled salmon and animals. In recent decades, sockeye salmon have dramatically declined in the Dry Bay/Alsek area. It is hoped that this study, by showing how the Tlingits historically understood and managed sockeye habitat, population and harvest in the Dry Bay/Alsek area, will aid in developing a restoration plan.

Introduction

The East Alsek River in Dry Bay has undergone a drastic decline in sockeye salmon return, affecting an important subsistence resource. A four-part multidisciplinary study combining western science and Traditional Ecological Knowledge (TEK) was designed to understand this decline and potentially remedy. This study was the first part of a larger four-part study design and gathered TEK from the Yakutat – Dry Bay area (northern Southeast Alaska) on traditional practices utilized by the Tlingit clans of Gunaxoo (Dry Bay).

Results

Dry Bay, Alaska is located along one of the most dynamic regions of the Alaska coast. Dry Bay is the delta of the Alsek River, which flows 240 miles from the Yukon to Dry Bay. At least twice in recent history the Lowell Glacier dammed Alsek River and formed Lake Alsek, which was about 200 m deep and over 100 km long. This area was settled first by the Athabaskan Indians, then by the Tlingit. Trading routes led from the Dry Bay region overland to the Yukon and Klukwan, Alaska area.

Salmon was a major resource utilized by the Yakutat Tlingit. From late spring to Fall-time, Tlingits went to various streams and rivers to harvest salmon. Traditional beliefs about the salmon spirits and human's relationship to their environment governed how Tlingits related to and treated salmon. Only by following certain customs and rituals would a hunter or fisherman be allowed to harvest animals. The "Salmon Boy" story taught Tlingits the proper behavior toward salmon and about salmon behavior.

Traditionally, each clan “owned” and managed specific areas for hunting, fishing and berry areas. It was the clan leader (chief) along with his council, that determined when fishing was opened, where the traps were to be placed, who’s allowed to harvest and how much they are allowed to harvest. If a man was caught violating any of the rules, his hunting equipment was taken away from his and sometimes his spear was broken up. Yakutat elder’s related how Chiefs used to monitor the salmon, open and close fishing on the Situk River using a white flag and direct the cleaning of the river.

Discussion and Conclusions

Traditional Tlingit Knowledge of Salmon in Yakutat and Southeast Alaska is based on thousands of years of collective observation and interaction with salmon. Traditional methods of management based on local control by clan, fishing methods and allocation of resources is different from contemporary methods were fishing sites are now privately owned, traditional fishing method are not used and allocation is by permit. The state is now divided into regulatory areas instead of clan territories, local state fish and game biologists monitor salmon runs instead of local clan leaders. Opening and closing of fishing based on monitoring of salmons escarpment is similar to traditional management.

Name: _____

Name of Interviewee: _____

How we take care of: _____ **(what resource?)**

1. Do you currently, or have you ever harvested _____?
2. How do you know when it is time to harvest?
3. What tools and technology do you use to harvest?
4. How often have you harvested this resource over the years?
5. Have you noticed a change in resource abundance or distribution?
6. Why do you think changes to this resource have/or have not occurred over time?
7. Do you, your family, or your community do anything to ensure this resource will continue to be in this area?
8. How do you show respect to this resource?
9. Do you know of any traditional practices, stories, or songs that encouraged healthy stewardship of this resource?
10. On average, how much do you rely upon each year?
11. If you have extra, what do you do with it?
12. Do you think current, local management is effective?
13. What would you like to see change?