**Using interdisciplinary research methods to  
address complex multi-jurisdictional resource issues:  
A case study of Lapwai Creek Watershed**

Ryan Boylan, Jim Browitt, Chris Currie,  
Allison Parker and Audrey Squires

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Profs. Boll and Cosens

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**Introduction**

Anthropogenic activities are the drivers for the degradation of many natural systems worldwide, and the Lapwai Creek Watershed is such an example. Human alterations to the landscape have had adverse effects on the *Oncorhynchus mykiss* (steelhead) population that spawns and resides in the waters located within the watershed’s boundaries. To further complicate the management of the watershed and, in turn, the steelhead population, a jurisdictional patchwork exists that is comprised of local, tribal, state and federal agencies. Addressing the management of the species is a complex mix of historical, legal, and hydrologic problems that cannot be easily answered by any single discipline. Taking an interdisciplinary approach to the problem in the Lapwai Creek Watershed, we were able to draw insights from relevant disciplines and integrate those insights into a more comprehensive understanding.[[1]](#footnote-1) This understanding helped us to develop a solution to the following integrating question: How do historical and legal issues result in water and habit quality issues for steelhead populations?

This report is broken into two sections: Section I addresses the methods we employed during the integration of process. In Section II we lay out the problem, outline our interdisciplinary understanding and present our solution.

**Section I: Methods of Integration**

The Field Trip

This project was initiated by a class field trip to the Lapwai Creek Watershed on October 2, 2011. The field trip introduced students to the watershed and to some of the disciplines involved in the problem. This introduction to Lapwai Creek issues represented the first step towards attaining interdisciplinary adequacy by helping students achieve “a basic feel of [the various disciplines] and a basic understanding of how [they] approach the problem.”[[2]](#footnote-2)

The field trip was guided by University of Idaho professors Dr. Brian Kennedy of the College of Natural Resource’s department for Fish and Wildlife Resources; Dr. Jan Boll, director of the Waters of the West program; and Barbara Cosens, College of Law. Because people from multiple disciplines led and attended the trip, it provided an opportunity to ask questions of experts in unfamiliar fields. The field trip included visits to various locations within the Lapwai Creek Watershed—areas of historical importance, fisheries data collection sites, and the Bureau of Reclamation/Lewiston Orchards Irrigation District diversion on Sweetwater Creek. Throughout the field trip, Dr. Kennedy and other participants provided us with useful information for understanding the intricacies of the watershed and its conflicts. While we learned about historical background, biological surveys and hydrologic and legal issues, we were also given an up-close view at how human development has impacted steelhead habitat within the basin.

Week 1

We agreed on a time for this meeting after Audrey emailed the group using Doodle, an online polling program, and asked members to select acceptable meeting times. By utilizing these electronic resources, Audrey began to address the logistical issues inherent in organizing schedules of multiple people who work in different buildings . By allowing the group to reach a consensus on meeting times, she provided an efficient and convenient means of communicating. In her email, Audrey reminded the group of the purpose for meeting. She wrote, “[a]s a reminder, in this meeting we are planning to talk about our backgrounds and how we see them fitting into this project; what disciplines could be involved in the problem and then which ones we will use in our analysis; and if we want/have time we could address things like a conceptual map, an integrating question, ground rules, etc.”

At the actual meeting, we identified goals we hoped to accomplish by the meeting’s end and agreed to begin each meeting with a discussion of what to accomplish during that meeting and to outline each person’s responsibility prior to the next meeting. After this decision, we agreed to utilize a system of filing shared documents. Based on our previous experiences with various programs we decided to use Wikispaces; Chris agreed to set up a group page. People noted that the updated history feature is useful because new versions are saved and old versions are archived. Because this archiving is a built-in feature, we hoped to track the progress of our project as it evolved from multi-disciplinary to interdisciplinary.

Additionally, we discussed the need to utilize legal Bluebook citations in this paper. Jim and Allison, the two law students in the group, agreed to create a “cheat-sheet” of Bluebook citations. Then we discussed how often we would like to meet and how we would like to structure these meetings.

After covering these administrative topics, we each presented our individual backgrounds, interests, and research. The exercise helped us find common ground, an important step toward integration.[[3]](#footnote-3) Normally, the integration process begins by the group agreeing on a problem.[[4]](#footnote-4) Here, the problem was already presented to us, in the form of the Lapwai Creek Watershed assignment. Not surprisingly, we all shared an interest and background in natural resource management. Additionally, many of us have backgrounds or interest in cultural and sociological history, hydrology, fisheries, and jurisdictional issues.

After considering the group’s disciplinary make-up, we decided to identify disciplines potentially relevant to the Lapwai Creek Watershed problem. Before conducting significant research it is important to “decide which disciplines contribute substantially to the problem” to be studied.[[5]](#footnote-5) This early decision allows interdisciplinary research to avoid “undu[e] influenc[e]” from “what disciplinary experts have already said about the problem.”[[6]](#footnote-6) We brainstormed disciplines applicable to the Lapwai Creek Watershed problem and then each person identified the discipline on which he or she had interest in working. Ultimately, we determined that Chris would focus on the project from a historical perspective, Jim on Native American law, Allison on jurisdictional and land use planning, Ryan on hydrology, and Audrey on fisheries.

Once we determined which disciplines we wanted to use, we considered how to narrow the scope of our issue. By narrowing the scope, we worked toward developing a unified and comprehensive plan.[[7]](#footnote-7) We discussed the use of integrating questions as a means of narrowing the issue’s scope.[[8]](#footnote-8) Some members had previously used integrating questions after deciding which disciplines to use, while others had used integrating questions as a means of narrowing group focus and determining from which disciplines to draw. Because we already had identified the disciplines of interest, we decided to use integrating questions as a tool for narrowing the group’s focus. Each person agreed to come to the next meeting with an integrating question. Finally, we discussed the group’s goals for scheduling work tasks. We decided to develop a timeline for rough draft and editing schedules but would make an official schedule at a later date.

Week 2

At the group meeting during the previous week, a mutually agreed-upon time for the next meeting was set for Monday, Oct. 24. Various members of the group, however, missed this meeting without sending notification to the others. This presented the possibility of conflict but, more importantly, an opportunity for the group to overcome it. Since we had already established open lines of communication, the members present at the meeting called the absence to the attention of the others. Absent group members apologized and suggested a new meeting time for the next day, which was accepted by all and that meeting was held. During that meeting, ground rules were re-established and the group was strengthened. Conflict was avoided because we followed the guidelines set by Prof. Maureen Laflin in her lecture to the WR 506 class on group dynamics and how to effectively manage conflict.[[9]](#footnote-9)

The eventual meeting also proved to be fruitful in furthering our progress on the assignment. Each group member brought what he or she thought to be an integrating question representative of the Lapwai Creek Watershed problem. We read aloud and discussed each integrating question. In merging the common themes, ideas and disciplines, we came up with the following: How do historical and legal issues result in water and habit quality issues for steelhead populations? This question clearly and concisely defines the problem; narrow enough in scope for the purposes of our project, it establishes the importance of this problem.[[10]](#footnote-10)

We chose to begin this process by writing individual integrating questions so each group member could highlight what he or she thought were the most important aspects of the problem. The integration process allowed us to discuss the pros and cons of each question, eliminate disciplinary bias, and create what we all agreed would be the focus of our group project.[[11]](#footnote-11) Establishing an integrating question was essential in narrowing the scope of the problem because issues within the Lapwai Creek Watershed are extremely complex and could potentially include many disciplines. Using the integrating question, each of us identified what topic within the scope of the question on which we would focus, and we set a goal for the next week of researching our respective disciplines as they pertain to the problem.

Week 3

In the week prior we drafted an integrating question that helped us create a common ground among the disciplines that we selected. On Nov. 1 we met to readdress the broad question we had posed and start the process of “integrating insights in order to create an interdisciplinary understanding.”[[12]](#footnote-12) With common ground discovered, we were able to create linkages between the disciplines and began to gain a comprehensive understanding of the problem.[[13]](#footnote-13) It became evident that by combining the insights from each discipline we would be able to yield a better explanation of the problem and create possible solutions.

The linkages we found were then transformed into five questions that we thought would provide a fluid means to address our integrating question. The questions that we chose to address were how social and cultural history has contributed to modern social and cultural conditions in the watershed, which lead us to how the legal history of the watershed has developed a mosaic of jurisdictional issues. Moving from the past to the present we wanted to examine the modern legal trends in the watershed and the challenges and opportunities for adaptive governance relating to the protection of steelhead. Furthermore, we wondered how the decisions of the modern legal trends have contributed to land use change causing the destruction of flood plain connectivity and channelization within the watershed. Finally, we addressed how the complex jurisdictional structure and modern legal trends affected steelhead habitat and the resident population.

Each member then selected a question that they would research and address in approximately two pages, and in the subsequent meeting we would merge the sections, thereby creating interdisciplinary understanding. At that time we would discuss possible solutions, which could be physical or process-based.

With the report outlined, it was decided that we should establish a timeline in order to meet our deadline. The timeline was as follows:

|  |  |
| --- | --- |
| **Date** | **Tasks** |
| 11/8 | 1) Individual outlines due.  2) Find common ground and continue integrating the sections. |
| 11/10 | 1) Bluebook examples due.  2) Outline methods section and assign sections to group members.  3) Start discussing possible solutions. |
| 11/15 | 1) Merge the methods section into a comprehensive whole. |
| 11/17 | 1) Individual sections for the paper written up.  2) Discuss what points we want to touch on in our presentation. |
| 11/19-27 **Fall Break** | 1) Round robin editing |
| 11/28 | 1) Monday in Morrill Hall to create presentation |
| 12/1 | **Final Draft Due and Presentation** |

In this meeting we also discussed the integrating question that we had posed the week before. We felt that the question was sufficient for the time being but were open to narrowing it down to a question that could be answered more readily once we had completed our research and writing.

Week 4

At this meeting we began developing a conceptual model. The development of the conceptual model during the latter half of our research project was a successful attempt to visually represent steelhead habitat segmentation in the Lapwai Creek drainage, the stakeholders, and opportunities for solutions. The conceptual model itself is a way to visually represent the structure of our inquiry specifically within the Lapwai Creek drainage’s socio-ecologic segmentation. The conceptual model highlights the circuital nature of the Lapwai Creek’s problems and its interdisciplinarity. The conceptual model, although created after our integrating question and individual outlines had been developed, reinforced our findings and solutions. Representing an issue in mixed-media is a functional and needed part of the solution-equation and a valuable experience for our group.[[14]](#footnote-14)

During the making of the conceptual model, Dr. Boll visited our work group. He shed light on our conceptual design by framing it as more of a concept map rather than a conceptual model; a model in this instance was a graphical representation of fact rather than a geographic representation of an issue. This led us to realize that this concept map was different than our respective groups’ models from the previous course exercise. Lapwai Creek’s issues draw on more disciplines, relying not only on segmented habitat but also on a fractured policy-space or an arbitrary space where policy-stakeholders make their decisions. In comparison to those aquifers, which present a somewhat less complex problem for local stakeholders, the Lapwai Creek quandary is complicated by tribal influence, history, and precedent, and consequently requires a more in-depth interdisciplinary approach.

Editing Process

After merging our sections, the final step in the project was to edit the group paper. We set up an editing schedule to use during Fall Break in which each group member had one day to spend with the paper. Using “track changes” on Microsoft Word, we were able to confer on edits to the satisfaction of all members of the group. Once we were all back on campus, we met again and covered any lingering problems or questions with the paper and then set up another editing round-robin to clean up the final product. At this meeting, we also discussed the format of our presentation and clarified the topic that each member would address.

**Section II: The Lapwai Creek Watershed Problem**

Cultural and Socio-Economic Issues

Historical issues laid the foundation for habitat segmentation and checkerboard jurisdiction in Idaho’s Lapwai Creek Watershed, creating decision-making problems for contemporary steelhead protection. Steelhead use this tributary to the Clearwater River as spawning grounds in the spring and fall. But the heavy modification and channelization of Lapwai Creek, and the absence of some natural floodplains, makes the difficult task of spawning in modified Pacific Northwest riverways even more challenging. The stakeholder/managerial decision space[[15]](#footnote-15) is occupied by regional and federal stakeholders who bring their own precedents, views, and previous experiences to the table. The decision-space refers to the arbitrary area where dominant ideas, interests, and institutions come together to find compromise and best solutions for resource issues. This diversity of stakeholders makes the Lapwai Creek Watershed issue very challenging. However, the ability to find compromise and progress in the decision space can be better achieved through managerial practices like adaptive governance or the ability to understand, expect, and work alongside flux in a system of management. The Lapwai Creek Watershed’s checkerboard of jurisdictions and socio-ecologic decision space is a challenging but digestible problem that will require interdisciplinary thought and integration to find better outcomes for the diverse stakeholders.[[16]](#footnote-16) The largest stakeholders within the watershed are the Nez Perce Tribe, Nez Perce County, Lewiston Orchards Irrigation District/Bureau of Reclamation, private landowners, and federal agencies such as FEMA, USFWS, and NMFS. Each stakeholder comes into this discussion with its own history and set of resource problems. For example, the traditional stewards of this resource were the indigenous Nimipuu, now known as the Nez Perce Tribe. The tribe, headquartered in Lapwai along the banks of the creek, plays a central role in the management of lands and fishery resources within the watershed. The Tribe has a storied history of treaties and compromises with other stakeholders. These treaties and compromises have often been breached, destroying established legal and cultural relationships and ultimately creating a fragmented and weak management system.

When the Nez Perce tribe entered into treaties with the U.S. government, the process essentially divided the tribe into “treaty” and “non-treaty” factions, which contemporary tribal members still note. The importance of these affiliations is seen as a cultural status within the tribe and even today is an important factor in tribal relations.  “Treaty” Nez Perce were sent to the reservation at Lapwai while the “non-treaty” members fled authorities, which eventually led to the Nez Perce War of 1877. The subsequent process of assimilation, discussed below, fragmented ownership of land within the reservation and created jurisdictional issues that continue to hinder management of the Lapwai Creek Watershed to this day.

The basin’s water system has been substantially altered from its historic form. Bureau of Reclamation channelization, Lewiston Orchards Irrigation District diversion, and floodplain development/encroachment have complicated steelhead management by affecting water quality and flow as well as the existence of riparian habitat.

Applicable Native American Law

The Lapwai Creek Watershed lies entirely within the Nez Perce Reservation, which was established in 1855 when tribal leaders signed a treaty that ceded to the federal government all but approximately 7.5 million acres of the tribe’s vast aboriginal homeland.[[17]](#footnote-17) The subsequent discovery of gold on those lands prompted the government to negotiate a new treaty with the tribe, which in 1863 reduced the reservation to its current size of approximately 770,000 acres.[[18]](#footnote-18) But that merely established the reservation’s exterior borders; ownership within that perimeter would be significantly altered in response to the Dawes Act.[[19]](#footnote-19) The 1887 legislation called for the allotment of reservation land to tribal members in parcels ranging from 320 to 80 acres, and for the government to purchase non-allotted land and make it available for non-Indian settlement.[[20]](#footnote-20) This was reflected in the Nez Perce Agreement of 1893, and led to what is commonly referred to as checkerboard land ownership within the reservation. As a result, only 112,300 acres, or 14.6 percent of the land within the reservation boundaries, are held in trust status for the tribe or its members.[[21]](#footnote-21)

Segmented ownership within a reservation creates questions as to whether jurisdiction falls to the tribe or a state instrument—be it a county, a city, or an agency of the state itself. As statutorily defined, Indian Country involves “(a) all land within the limits of any Indian reservation under the jurisdiction of the United States Government,” which includes property held in trust.”[[22]](#footnote-22) This gives rise to the issue of diminishment: Is a tribe’s sovereign power over the land within its reservation boundaries reduced by non-tribal ownership? In *Solem v. Barlett,* the Supreme Court held that this must be determined by assessing congressional intent.[[23]](#footnote-23)

As a doctrinal matter, the States have jurisdiction over unallotted opened lands if the applicable surplus land Act freed that land of its reservation status and thereby diminished the reservation boundaries. On the other hand, federal, state, and tribal authorities share jurisdiction over these lands if the relevant surplus land Act did not diminish the existing Indian reservation.[[24]](#footnote-24)

According to the Ninth Circuit Court of Appeals, the Nez Perce Reservation falls under the latter circumstance. In *United States v. Webb,*[[25]](#footnote-25) the Ninth Circuit found no evidence of congressional intent to diminish the reservation, deciding that “[a]s long as retention of the 1863 reservation boundaries is consistent with the terms of the 1893 Agreement, there is no diminishment or disestablishment.”[[26]](#footnote-26)

Yet, while the *Webb* ruling appears to strengthen the Nez Perce Tribe’s position in regard to Lapwai Creek Watershed management, the Supreme Court’s opinion in *Brendale v. Confederated Bands & Tribes of Yakima Indian Nation*[[27]](#footnote-27)marginalizes it. The Court held that tribal authority over non-Indian property owners could be exerted only when activity on fee land within a reservation’s boundaries threatened “the political integrity, economic security, or the health and welfare of the tribe.”[[28]](#footnote-28) So unless some materially adverse effect can be shown, the Nez Perce Tribe holds no sway over zoning decisions exercised by the three counties in which the watershed is located, or the three municipalities found within it.[[29]](#footnote-29)

Contemporary Management Solutions to Historical Problems: Adaptive Governance

Watersheds are not confined by political boundaries. Despite this reality, management decisions are made by entities with piecemeal control over the watershed as a whole. Additionally, decisions made by one governmental entity may affect the management plan of another. Indeed, in a watershed like Lapwai Creek, where multiple governments assert jurisdiction, management becomes challenging for several reasons. Not only is there uncertainty about which government even has authority to take action, but uncertainty also surrounds the effects of one government’s management plan on those of other entities.

Adaptive governance provides a means of addressing these challenges and managing water resources in the face of uncertainty. The goal of this adaptive governance is to incorporate resilience into management schemes.[[30]](#footnote-30) “Resilience is the capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks . . . .”[[31]](#footnote-31) Adaptive governance achieves resiliency by making management changes in incremental steps and then monitoring the results.[[32]](#footnote-32) These results are incorporated into the next round of incremental management changes.[[33]](#footnote-33) Additionally, adaptive governance also involves management across jurisdictional and agency boundaries.[[34]](#footnote-34)

The complex jurisdictional situation in the Lapwai Creek Watershed presents challenges to adaptive governance because the presence of multiple governments asserting jurisdiction can result in missed monitoring opportunities and a lack of authority to implement management changes. Here, in the Lapwai Creek Watershed, tribal, state and local, and federal governments all have jurisdiction of different areas. If the agencies from these various governments fail to communicate data gathered from monitoring, each agency will lack an understanding of the actual effects of its management changes. Additionally, because each entity has authority over different areas, the authority to implement management plans within the watershed may be varied. In a watershed like Lapwai Creek, where multiple governments assert jurisdiction, an agency may lack the authority to actually implement management plans in response to changing data. This inability to implement plans results in inaction.

For example, in Lapwai Creek, the federal government has acted in ways that affect the watershed as a whole. Under the Endangered Species Act (ESA), the Federal government listed “five Snake River salmon and steelhead runs . . . as either threatened or endangered.”[[35]](#footnote-35) Later, pursuant to the Act, the National Marine Fisheries Service (NMFS) designated Lapwai Creek, Sweetwater Creek, and Webb creek as critical steelhead habitat.[[36]](#footnote-36) Additionally, the Federal Emergency Management Agency (FEMA) implements a floodplain management plan that encourages development within a floodplain. Without agency interaction, the only means to remedy this situation is through lawsuits. For instance, in *National Wildlife Federation v. Federal Emergency Management Agency*,[[37]](#footnote-37) National Wildlife Federation (NWF) challenged FEMA’s management plan in the Puget Sound on the grounds that issuing flood insurance without meeting consultation requirements violated the ESA because it jeopardized Chinook salmon.[[38]](#footnote-38) While local or tribal governments may recognize the problems created by this scheme, they are powerless to address them.

Hydrology and Fisheries Habitat

In *NWF v. FEMA*, NWF argued that the National Flood Insurance Program (NFIP), as currently implemented by FEMA, could result in increased development in flood-prone areas, resulting in functional floodplain impairment of salmon bearing waters.[[39]](#footnote-39) A Biological Opinion filed by National Marine Fisheries Service (NMFS) following the *NWF v. FEMA* decision further supports this argument. NMFS concluded that the implementation of NFIP is likely to jeopardize the continued existence of the following anadromous populations: Puget Sound Chinook salmon, Hood Canal summer-chum salmon, and Puget Sound steelhead.[[40]](#footnote-40) Similar issues have appeared in the Lapwai Creek Watershed, presenting the same problems for the steelhead populations that reside there.

Steelhead is a historic trout population with important cultural significance to the Nez Perce Tribe. The species is federally listed as part of the Snake River Basin steelhead distinct population segment (DPS) with Lapwai Creek designated as critical habitat.[[41]](#footnote-41) Because there are legal, jurisdictional, and social issues affecting decision-making within the watershed, the management and protection of steelhead in the Lapwai Creek basin cannot be based solely on the identification and fulfillment of the specific hydrological and biological requirements of the fish. The legal and jurisdictional complexities within the Lapwai Creek Watershed have direct impacts on the habitat provided within the stream network, thus affecting the viability of the local steelhead population. As mentioned above, the overlapping jurisdiction between the Nez Perce Tribe and Nez Perce County requires integrated management of the watershed and the fishery through adaptive governance.[[42]](#footnote-42) To further complicate management, NMFS, rather than the U.S. Fish and Wildlife Service, is the agency that oversees steelhead because it is an anadromous species. These human-based complexities need to be overcome in order to properly protect the steelhead population in Lapwai Creek.

The human-based complexities make up just one page in the book of complex issues in the Lapwai Creek Watershed. The watershed drains an area of 174,600 acres and is comprised of Lapwai Creek, which flows from upland areas dominated by dry land agriculture while grazing and logging activities are prevalent throughout the headwaters and canyons.[[43]](#footnote-43) The Lapwai Creek mainstem is fed by the tributaries of Mission, Sweetwater, Webb, and Tom Beall creeks.[[44]](#footnote-44)

Landscape alterations have created problems with water quality and quantity, affecting the native and migratory steelhead populations. For example, paved, gravel, and dirt roads constrict many miles of stream throughout the drainages and create numerous fish passage barriers at locations where stream channels are crossed.[[45]](#footnote-45) Irrigation diversion structures such as the LOID canal removes water from Sweetwater and Webb creeks. Water reduction can have significant impacts on many abiotic factors (temperature, oxygen, sediment load), in turn altering the structure and function of stream biotic communities.[[46]](#footnote-46) The alterations to the landscape, and various land uses provide a unique set of circumstances, which contributes to highly degraded aquatic conditions throughout the watershed.[[47]](#footnote-47)

Another alteration to the landscape specifically affecting steelhead habitat is the development of floodplains. Floodplains are important for steelhead populations because they function as refuge areas with lower velocities during periods of flooding and provide nutrient and sediment exchanges that are essential to the species.[[48]](#footnote-48) It can be deduced that if there is no connection to the floodplain, the fish species that rely on these areas can lose access to these types of refuge and may not survive a large flood event.[[49]](#footnote-49)

The NFIP implemented by FEMA has disrupted flood plain connectivity in many ways, but we will touch on just two here. First, communities that participate in the NFIP must comply with the NFIP’s minimum floodplain management criteria, which permit development in the floodplain as long as structures are placed on fill or stem walls at or above the base flood elevation (BFE).[[50]](#footnote-50) This is the water surface elevation associated with a 100-year flood. Filling or building stem walls one foot above the BFE will destroy any existing flood plain connectivity and encroach on the existing stream channel. The encroachment will increase stream velocities and volumes. In turn, the refuge that was once present will be fragmented or destroyed.

Second, if levees are constructed to mitigate flood damage, FEMA will not include these areas in the mapping process or will require the purchase of flood insurance—reasoning that the levees will protect any development in these areas from floods. Levees diminish floodplain storage of water during floods, and confine the flows within a walled channel, pushing the flooding farther downstream and adding pressure to extend the levee flood.[[51]](#footnote-51) This increases stream flow velocities in the channel, sediment loads, and erosions rates.

In 2007, a significant effort was made toward inter-agency collaboration through the joint writing of the Lapwai Creek Watershed Ecological Restoration Study (LCWERS) by the Nez Perce Tribe Department of Fisheries Resources Management, Watershed Division and the Nez Perce Soil and Water Conservation District. This is an important step toward adaptive governance that could lead to better protection of steelhead. Five primary factors that affect the ability to maintain a viable population of steelhead in the Lapwai Creek Watershed were identified in this document: “high summer instream temperatures, excessive sedimentation, loss or disturbance of riparian habitats, changes in vegetative structure, and alteration of environmental processes.”[[52]](#footnote-52) These factors are intertwined and linked to habitat alteration through land use changes and other human-induced modifications that affect streams. Through reversing the social and management actions that have caused those habitat alterations, there is the potential for restoration within the watershed with respect to each of the factors outlined above. LCWERS recommends that restoration activities primarily focus on (1) watersheds of high fish density and (2) the reconnection of presently disconnected high quality fish habitat to habitat where fish are currently present.[[53]](#footnote-53)

Reducing the amount of withdrawals from the stream will increase flow and have a positive effect on temperature regime, depth of the stream, and creation of areas of refuge such as pools and riffles because the added water will create a wider, more diverse stream profile.[[54]](#footnote-54) Decreasing the sediment load in the stream will create better habitat for steelhead through reducing turbidity, increasing dissolved oxygen levels, and enhancing macroinvertebrate production.[[55]](#footnote-55) Decreased sediment load can be achieved through implementing best management practices in agricultural fields and the restoration of vegetation to the riparian zones to reduce erosion. Best management practices are soil conservation measures that provide water quality benefits while still being economically viable to the farmer. Vegetated riparian zones will also aid in lowering water temperatures while providing a source of large woody debris to the stream thereby increasing habitat diversity. All of these restoration options will also provide better spawning habitat.

**Section III: Solutions to the Lapwai Creek Watershed Problem**

While the complex jurisdictional situation in the Lapwai Creek Watershed can be a challenge to adaptive governance, it can also enhance opportunities for adaptive governance. The presence of multiple governments asserting jurisdiction provides more opportunities for shared knowledge and increased collaboration. When multiple agencies monitor and then share information about a watershed, each managing entity benefits from increased information. This can result in more sophisticated management changes. Ultimately, the results of these changes are monitored by multiple agencies, culminating in more responsive adaptive management. Additionally, when agencies collaborate on management implementation strategies, they create a more resilient management structure. By allocating resources from multiple agencies to a management plan, the implementation is not dependent on any one agency. The presence of multiple agencies helps ensure that the agencies most capable of implementing plans do so and that more than one agency addresses implementation.

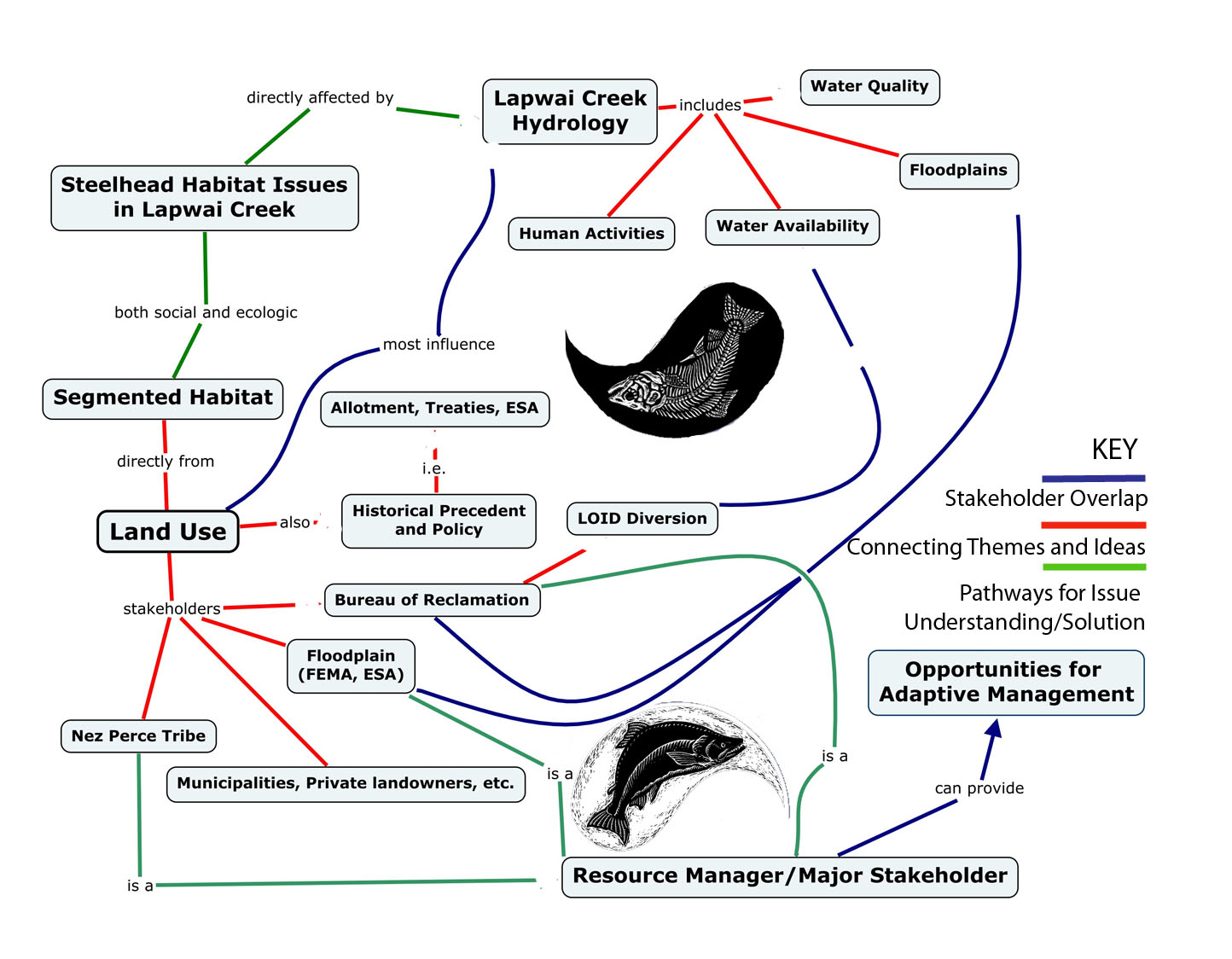
Indeed, in assessments of the Lapwai Creek community, interviewees have expressed interest in such adaptive management schemes. “According to many of the interviewees, counties and the Nez Perce Tribe have not traditionally partnered on these issues, but several stakeholders, including county government representatives, expressed interest in seeing stronger working relationships.”[[56]](#footnote-56) By fostering stronger working relationships, the stakeholder will work toward developing adaptive governance within the Lapwai Creek Watershed. Ultimately, application of adaptive governance will allow stakeholders to fully utilize the many resources within the watershed with minimal impact. When resources are fully utilized, the overall resilience of watershed governance will increase.

**Conclusion**

By approaching the Lapwai Creek Watershed problem from an interdisciplinary perspective, we developed our individual abilities to work across disciplines and to work within a multi-disciplinary group. Additionally, by recognizing that we each had certain disciplinary biases, we were able to put these biases aside and work together to develop an interdisciplinary product. Because we regularly communicated verbally and through paper drafts, we taught each other about our disciplines and were able to help one another achieve interdisciplinary adequacy. Ultimately, our communication resulted in the ability of any one group member to articulate the entire project and proposed solution.

We determined that because of the social, legal, and ecological history of Lapwai Creek, the watershed is managed by stakeholders with many resources but without many relationships. By considering this problem through the lens of adaptive governance theory, we decided that an approach to remedy this disconnect includes developing adaptive management schemes within the watershed, something to which stakeholders are already receptive.

Appendix I: Concept Map



1. William H. Newell, *A Theory of Interdisciplinary Studies in Issues In Integrative Studies,* 19 Issues In Integrative Studies, 2001 at 1. [↑](#footnote-ref-1)
2. Allen F. Repko, Interdisciplinary Research: Process and Theory 43 (2008). [↑](#footnote-ref-2)
3. Dr. Jan Boll, Lecture to Water Resource 506 Class: Integrating Questions (Sept. 8, 2011). [↑](#footnote-ref-3)
4. *Id.* [↑](#footnote-ref-4)
5. Repko, *supra* note 2, at 161. [↑](#footnote-ref-5)
6. *Id.* [↑](#footnote-ref-6)
7. Boll, *supra* note 3. [↑](#footnote-ref-7)
8. *Id.* [↑](#footnote-ref-8)
9. Maureen Laflin, Lecture to Water Resource 506 Class: “Team Building—Cultivating Cooperation, Collaboration and Communication” (Aug. 30, 2011). [↑](#footnote-ref-9)
10. Repko, *supra* note 1, at 147. [↑](#footnote-ref-10)
11. *Id.* at 145. [↑](#footnote-ref-11)
12. *Id.* at 296. [↑](#footnote-ref-12)
13. *Id.* at 301. [↑](#footnote-ref-13)
14. Marieke Heemskerk et al., *Conceptual Models as Tools for Communication Across Disciplines,* 7 Conservation ecology 9 (2003). [↑](#footnote-ref-14)
15. Nicole D. Peterson, *Choices, Options, and Constraints: Decision Making and Decision Spaces in Natural Resource Management*, Society for Applied Anthropology 54 (Spring 2010). [↑](#footnote-ref-15)
16. [↑](#footnote-ref-16)
17. Idaho Indian Tribes Project, http://www.idahogenealogy.com/indian/nez\_perce\_indian\_reservation.htm (last visited Nov. 19, 2011). [↑](#footnote-ref-17)
18. *Id.* Subtle amendments requested by the tribe led to a third treaty, which was signed in 1868. This did not alter the reservation boundaries established by the 1863 treaty. [↑](#footnote-ref-18)
19. 25 U.S.C.A. § 331 (repealed 1934). Also known as the General Allotment Act. [↑](#footnote-ref-19)
20. *Id.* [↑](#footnote-ref-20)
21. The Updated 2009 Economic Impact Analysies (sic) of the Nez Perce Tribe, http://www.nezperce.org/official/PDF/Updated2009EcominicImpactAnalysisBrochure.pdf. [↑](#footnote-ref-21)
22. 18 U.S.C.A. § 1151 (West 2011). [↑](#footnote-ref-22)
23. Solem v. Barlett, 465 U.S. 463, 470 (1984) (Court applied a three-tiered analysis in determining if Congress had intended to diminish a reservation through distribution of surplus lands). [↑](#footnote-ref-23)
24. *Id.* at 467. [↑](#footnote-ref-24)
25. United States v. Webb, 219 F.3d 1127 (9th Cir. 2000). [↑](#footnote-ref-25)
26. *Id.* at 1135. [↑](#footnote-ref-26)
27. Brendale v. Confederated Bands & Tribes of Yakima Indian Nation, 492 U.S. 408 (1989). [↑](#footnote-ref-27)
28. *Id.* at 431. [↑](#footnote-ref-28)
29. The Lapwai Creek Watershed lies primarily in Nez Perce County but also reaches into Idaho and Lewis counties. In addition to the cities of Lapwai, Culdesac and Sweetwater, the watershed also includes the unincorporated communities of Spalding, Sweetwater, Reubens, and Slickpoo. [↑](#footnote-ref-29)
30. Barbara Cosens, Lecture to Water Resource 506 Class: Water Governance (Oct. 25, 2011). [↑](#footnote-ref-30)
31. Walker et al., *Resilience, adaptability and transformability in social–ecological systems,* 9 Ecology and Society 5 (2004). [↑](#footnote-ref-31)
32. Cosens, *Supra* note 30. [↑](#footnote-ref-32)
33. *Id.* [↑](#footnote-ref-33)
34. *Id.* [↑](#footnote-ref-34)
35. Loree Higgins et al., Lapwai Creek Watershed Situation Assessment 4 (Jan. 15, 2011) (on file with University of Idaho Waters of the West) [hereinafter Situation Assessment]. [↑](#footnote-ref-35)
36. *Id.* [↑](#footnote-ref-36)
37. National Wildlife Federation v. Federal Emergency Management Agency, 345 F.Supp.2d 1151 (W.D. Wash. 2004). [↑](#footnote-ref-37)
38. *Id.* at 1155. [↑](#footnote-ref-38)
39. *Id.* [↑](#footnote-ref-39)
40. National Marine fisheries Service, Endangered Species Act - Section 7 Consultation Final Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation 83 (2008) [hereinafter Bi-Op]. [↑](#footnote-ref-40)
41. Shannon Richardson & Lynn Rasmussen, Strategy for the Ecological Restoration of Lapwai Creek Watershed, iii (Oct. 2007). [↑](#footnote-ref-41)
42. Barbara Cosens & Mark Williams, Resilience and Water Governance: Adaptive Governance in the Columbia River Basin 6 (May 2011). [↑](#footnote-ref-42)
43. Richardson & Rasmussen, *supra* note 41, at 25. [↑](#footnote-ref-43)
44. *Id.* at 23. [↑](#footnote-ref-44)
45. *Id.* at 25. [↑](#footnote-ref-45)
46. Richard B. Hartson, A Comparative Analysis of Habitat and Juvenile Steelhead (Oncorhynchus mykiss) Demographics in an Altered Watershed (Nov. 2010) (unpublished M.S. thesis) (on file with the University of Idaho College of Graduate Studies). [↑](#footnote-ref-46)
47. Richardson & Rasmussen, *supra* note 41, at 27. [↑](#footnote-ref-47)
48. Bi-Op, *supra* note 40, at 3. [↑](#footnote-ref-48)
49. Ashley Williams, Floodplain Delineation Methodology Utilizing Lidar Data with Attention to Urban Effects, Climate Change, And Habitat Connectivity in Lapwai Creek, Idaho 115 (May 2011) (unpublished M.S. thesis) (on file with the University of Idaho College of Graduate Studies). [↑](#footnote-ref-49)
50. Bi-Op, *supra* note 40, at 4. [↑](#footnote-ref-50)
51. *Id.* [↑](#footnote-ref-51)
52. Richardson & Rasmussen, *supra* note 41, at 6. [↑](#footnote-ref-52)
53. *Id.* at 45. [↑](#footnote-ref-53)
54. Dr. Brian Kennedy, Lecture to Water Resources 506 Class, “The Ecology of Rivers and Salmon,” (Oct. 13, 2011). [↑](#footnote-ref-54)
55. T.C. Bjornn and D.W. Reisner, *Habitat Requirements of Salmonids in Streams, in* Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitats 83, 85 (W.R. Meehan ed. 1991); Richardson & Rasmussen, *supra* note 41, at 21. [↑](#footnote-ref-55)
56. Situation assessment, *supra* note 35, at 8. [↑](#footnote-ref-56)