Designing the Methow Mobile Field Station

A sustainable solution to seasonal housing in the Methow Valley

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Executive Summary

Our team is developing design concepts for a mobile, seasonal field station for students completing a sustainability residency in the Methow Valley. The area is most widely known as a destination for outdoor recreation in both winter and summer months. As the local tourism economy continues to grow, the Valley has seen a steady increase in both full- and part-time homeowners. Over the past 15 years, data reports a diminishing affordable housing stock and an increase in housing prices (Brunner, 2016). The ongoing housing crisis in the Methow Valley has made finding housing for WWU interns a struggle.

Our team proposes building a tiny home mobile field station to house Western Washington University students during eight-month long internships in the Methow. Built on the Twisp Ponds Property right outside of Twisp, Washington, and designed with the needs of both students and the community in mind, the field station could provide housing for up to 16 students while also modeling community land stewardship concepts. Our recommendations address steps to be taken in the permitting process, the functionality of a community learning and gathering space, and budget-friendly options of mobile tiny homes on trailers. This report also strives to serve as a guide on how to begin the process of permitting for tiny homes in Okanogan County for the convenience of other organizations considering such a project. The need for local housing was also considered in our objective to provide housing for the remainder of the year to community members impacted by natural disasters or a youth climate corps.

Our team interviewed local stakeholders, workshopped with current Community Learning Lab students, researched mobile tiny home options, benchmarked other co-housing communities, and researched the County and State regulations regarding utility use and temporary structures. We envision a sustainable community of mobile tiny homes that would foster a strong sense of community with the field station residents, and include local stewardship projects.

Land Acknowledgement

This project is centered on the unceded land of the Methow peoples, including the Methow, Chelan, Wenatchi, Entiat, Columbia, Okanogan, Lakes, Colville, Sanpoil, Nespelem, Chief Joseph Band of Nex Pierce, and Palus people. We ask you to join us in acknowledging the Methow community, their elders both past and present, as well as future generations. We also acknowledge that the cities of the Valley as we know them today were founded upon exclusions and erasures of many Indigenous peoples. This acknowledgement demonstrates a commitment to contributing to the process of working to dismantle the ongoing legacies of settler colonialism.

1.1 Statement of Need

The Methow Valley Community Learning Lab needs student housing for future eight month fellowship programs. The Community Learning lab is in partnership with the Huxley College of the Environment at Western Washington University. Part of the fellowship includes taking the Campus Planning and Sustainability Planning Studio (CSPS) course, where students are divided into groups and tasked with providing recommendations for different sustainability oriented and community based projects throughout the region. This project addresses the issue of housing availability and affordability in the Methow Valley. We propose to build a community of sustainable, mobile tiny homes to house WWU students engaged in place-based education programs with the possibility of addressing the housing needs of a youth climate corps or displaced disaster victims via our recommendations. Such a field station would assist in meeting the housing needs of the CSPS program without adding a burden on the larger housing issue in the Valley. This creative solution to living arrangements ensures that the Methow Valley remains an affordable, accessible place to live for all.

1.2 Project Goals

1.2.1 Sustainable Solutions to Student Housing within the Housing Crisis

By providing multiple small units that can reside on one parcel of land, the mobile field station addresses the need to house a number of WWU interns during the growing season of April to November. In response to the ongoing housing crisis in the Methow Valley, our team's goal is to design a creative and sustainable solution to alternative housing styles which will not burden those who are already struggling to find housing solutions locally.

One of the benefits of our recommendations is the potential to house other community members who are in need of short-term housing like disaster victims, a youth corps, or other WWU course students during the months in which the field station is not in use.

1.2.2 Sustainable Land Stewardship

Our project also strives to emphasize a place-based education within the Community Learning Lab. Students will have the opportunity to participate in a multitude of land stewardship activities that provide a deep sense of belonging and gratitude for place-based knowledge. These activities include wildlife monitoring, salmon restoration, invasive species control, native plant monitoring, and aquatic monitoring. During the eight months out of the year in which the cohort will live at Twisp Ponds, there will be ample opportunity for students to engage in place-based learning.

1.2.3 Inspiration and Education

Some of our goals for the future engagement with our project include asking questions on how community members can relate to our results and recommendations in a meaningful way.

For example, as a team we asked ourselves: How can this model of living set a new standard of living - or even change our understanding of the intersection between housing and sustainability, especially relating to the housing crisis in the Valley? Could our recommendations foster a change within the County's **zoning** code that would allow for the process of building a mobile tiny home to become easier? We also asked ourselves questions of how this project would support a sustainable lifestyle: How could the field station residents engage in sustainable relationships with the land, with the community, and with each other? Though broad, these questions served to guide us as we navigated through a very ambitious and complex project.

Municipalities use **zoning** laws to divide areas of land into different uses, such as residential, commercial, and industrial.

1.3 Background Research

There is ample evidence for the need for creative and alternative solutions to the housing crisis in the Methow Valley. For example, in 2000, 51% of homes were $150,000 or less (Brunner, 2016). In 2016, only 17% of homes were in that price range, while 28% were worth $300-$500k (Brunner, 2016). Further, COVID-19 has brought newcomers into rural areas like the Methow Valley, seeking respite from urban dwelling. The Methow Valley currently has an estimated 350-unit (rental and ownership) housing shortage (Methow Housing Trust, 2020). It has been increasingly difficult to afford to purchase and maintain a home in the Methow Valley while earning an average local salary. In 2016, 39% of homeowners in Methow spent more than 35% of their household income on monthly homeowner costs, compared to about 27% for both Okanogan County as a whole and Washington State (Miller, 2020).

Recent housing reports done locally indicate that tiny home options are an example of a flexible solution to the problem, an opinion echoed by multiple community perspectives. For example, due to the proximity of forest fires in the Methow Valley, survey respondents in a 2016 study reported that they would prefer mobile homes that could easily be towed out of harm's way if they were given the option (Brunner, 2016). In Okanogan County, 36% of people indicated that they would like to see more tiny homes as potential forms of housing (Miller, 2020).

Mobile tiny homes are a great sustainable solution to individual and community housing needs. For example, residential and commercial buildings in the U.S. account for nearly 40% of carbon emissions and 14% of potable water usage (Tiny SMART House, n.d.) . Construction also generates tens of millions of tons of landfill waste - annually! Tiny houses, in general, have a smaller environmental effect than traditional residential houses because they require much less energy to construct, heat, and cool. For example, tiny houses can go a long way towards reducing an individual's or family's carbon footprint. Tiny houses, which typically measure between 100 and 400 sq. ft., have been shown to consume up to 54% less energy than a traditionally-sized house (Davidson, 2019). The average American requires 20.8 acres of resources (including housing, transportation, food, goods, and services) to sustain their lifestyle, while the average

tiny home owner uses only 9.5 acres. Another study emphasized that without a robust amount of room for shopping, tiny home dwellers simply bought less, writings that as a whole, “after downsizing people were more likely to eat less energy intensive food products and adopt more environmentally-conscious eating habits, such as eating more locally and growing more of their own food. Participants traveled less by car, motorcycle, bys, train, and airplane, and drove more fuel-efficiency cars than they did before downsizing.” (Davidson 2019).

The tiny mobile field station strives to include sustainable practices within its design. For example, by reducing the amount of energy needed to construct and maintain the tiny homes, students living at Twisp Ponds for eight months will have a much lower environmental impact than living elsewhere for the same period of time. The field station will also be designed to include elements of land stewardship, which will foster a respectful relationship to the land. The proximity of Twisp Ponds to town also encourages more walking or biking, and less driving.

1.4. Connection to the UN Sustainable Development Goals

The United Nations’ 17 Sustainable Development Goals (SDGs) have been created to guide the world towards creating a sustainable and equitable future which will avoid the worst consequences of the climate crisis (United Nations Department of Economic and Social Affairs, *The 17 Goals*). They have the ability to be adapted to any scale of system: from a single household to an entire continent. Our project builds upon a number of the SDGs, including the goals for No Poverty (1); Good Health and Well-Being (3); Industry, Innovation, and Infrastructure (9); Sustainable Cities and Communities (11); and Partnerships (17). Our proposal is simultaneously small enough to tangibly demonstrate the broad scope of the SDGs and large enough to leave room for contributions from anyone in the Methow Valley with the interest to get involved. This tiny home community will be a place of gathering and sharing where people can learn from one another and bring leadership to bigger goals. Moreover, implementing these SDGs into the day-to-day functions of the tiny community will benefit the members by providing a comprehensive guide to sustainable lifestyles, offer a framework for demonstrating their impact, create new funding streams, and can help support collaboration with both external and internal partners for future learning.

Figure 1: Depicts SDGS that the field station engages with.

2.1 Benchmarking existing projects

A significant portion of our research came in the form of gathering knowledge from existing projects with similar goals and specifications as ours. Our primary topics of interest were options for prefabricated home options, community structure and layout, and the permitting process. We also studied the local economy, history, and housing market in order to properly situate our project in the greater context of the Methow Valley. To ensure the opportunity of deep research, group members specialized in chosen topics based on interest: Owen investigated tiny home options, Sophia evaluated community layouts, Lillian delved into details on the Methow Valley, and Zoe looked into the permitting process. Each topic took on several of many forms of research, including online exploration, reaching out to builders and tiny home owners, and locating knowledgeable local organizations. Benchmarking existing projects was especially helpful for determining our priority criteria for the structures themselves as well as for understanding the sequence of steps to the permitting process.

2.2 Stakeholder identification

In order for the Tiny project to have the greatest chances at success, we understand that it is crucial for all stakeholders to be identified early on and continually engaged throughout the process. A project such as this one must involve a wide range of community members in order to be as inclusive as possible, and we used a detailed systems-thinking approach to determine where we could invite more voices. The most recognizable stakeholders are those who will be directly involved with the project: MSRF as the owners of our chosen property, Joshua Porter as director of the educational programs in the Methow, and students participating in those programs as the primary dwellers of the field stations. The municipality of Twisp and Okanogan County were also considered stakeholders for their direct involvement in the permitting process. In considering the broader impacts of the project, we went on to list Western Washington University, sources of funding, the owners of properties adjacent to MSRF's, and local building and contracting companies as valuable voices to engage. Finally, we gave great importance to the voices of the land and Twisp River themselves as stakeholders in the project. As stewards of the Valley since time immemorial, we consider members of the Colville Confederated Tribes, especially the Methow Tribe, to act as excellent spokespeople to the needs of the land and river. The nearby Homestream Park and Methow Valley Interpretive Center serve as points of contact to members of the tribes as well as examples of traditional Indigenous land stewardship. WWU's Community Learning Lab is continually devoted to building reciprocal and respectful relationships with the Methow people.

Though they may not act as stakeholders in our project, we also identified many individuals who served as valuable sources of information, either due to their research and professional backgrounds or their personal experiences. Kellen Lynch, leader of WWU's Project ZeNETH as well as Twisp local Madelyn Hamilton offered guidance on locating prefabricated

models in the region and initiating the processes of permitting and construction. Moreover, community members who are in any way susceptible to losing their homes due to natural disasters will serve as important voices in the future. Though not within the scope of this report, the potential for such victims to live in the tiny home community when it is not occupied by students is a topic for future investigation.

2.3 Interviews with stakeholders

Individual interviews served as our primary source of contact with the stakeholders identified above. Most discussions took the form of hour-long in-person or Zoom meetings to which we brought a personalized list of questions. Questions were curated based on the expertise of the interviewee and often served to guide conversation rather than extract specific information. After initial meetings, we continued to engage with stakeholders wherever possible by keeping them updated on our progress and by arranging follow-up meetings as needed. Though schedules occasionally conflicted, we ensured that at least two group members were always present during interactions with stakeholders to ensure strong connections among all those involved.

2.4 Student preferences survey

A survey sent out to the 2021 the combined cohorts of the Climate Change Leadership Certificate and Community Learning Lab was our primary means of evaluating preferences and priorities for the field station community among students representative of future tiny home dwellers. It consists of a variety of multiple-choice and short-answer questions to investigate priorities for amenities to be offered in the community, including electricity, running water, kitchen access, and social spaces. Respondents were also given the opportunity to list additional amenities or features which they would consider to be important within the community. Results from the survey, which will be discussed in sections below, were used to determine which amenities to provide in individual living units as opposed to shared spaces. Students were given one week to provide responses to the survey and their identities remained anonymous.

After conducting multiple interviews with community stakeholders as well as benchmarking other options for mobile tiny home design, we have generated results on student preferences for the field station and tiny home design, information about zoning and permitting for mobile tiny homes, information about the Twisp Ponds property, as well as insights on what the future of the WWU Campus Sustainability Planning Studio Internship will look like. For information about the tiny homes themselves, our results include three different options of the make and model of mobile tiny homes that we found to be most cost efficient for our requirements. By providing more than one option, we hope to give the reader a scope of what different amenities could be included and at what price.

3.1 WWU Campus Sustainability Planning Studio Internship

The primary residents of the tiny home community will be students participating in place-based education and local sustainability internships during an eight-month period from April to November. The internship is part of WWU's Community Learning Lab, where students take the Campus Sustainability Planning Studio (CSPS) course alongside their individual internships within the Methow Valley. The CSPS course offers hands-on, problem-based learning by tasking students with research projects centered around sustainability initiatives in their community. The program layout would include three days a week dedicated to internships supporting sustainability initiatives in local organizations, farms, businesses, offices, and nonprofits. The other two days of the work week will be reserved for class time, allowing students enough time to work on any course projects and assignments.

3.2 The Twisp Ponds Property

Owned by the Methow Salmon Recovery Foundation, a 37-acre parcel of land, referred to as the Twisp Ponds land, is our proposed site for the tiny house community. The land lies less than one half mile from the center of Twisp and is bordered by the Twisp River, from which it benefits from a small water right. Though otherwise undeveloped, the land supports two wells and one structure called the Yellow Barn, which is connected to the town septic system and has access to electricity from the Okanogan County Public Utility District (PUD). The MSRF has expressed enthusiasm for the idea that the Yellow Barn be retrofitted to accomodate a communal kitchen, bathroom, or social space.

Twisp ponds is a working restoration site open to the public with trails lined by native plant species. Years ago, this land was going to be used for residential development with plans for the construction of four homes. Between 2001 and 2007, the Methow Salmon Recovery Foundation (MSRF) purchased nine parcels from four landowners and in 2002 began riparian planting and other restoration projects. They also built an interpretive center meant to be used for educational activities. Between 2007 and 2009, four more properties were added, bringing the site's size to 37 acres (Methow Salmon Recovery Foundation, 2021).

Breakdown of the Permitting Process						
Permitting step	**Component of**	**Organization(s)**	**Timeline**	**Details**	**Special Considerations**	**Resources***
Land use application	CUP application	Okanogan County	90-120 days	Included in the CUP application packet. Consult with MSRF to discuss the availablity of records on the land, especially environmental assessments and studies of the land or watershed.	Include details of the extensive resotration efforts on the land by MSRF, especially before/after pictures and details of ongoing projects (if any).	Okanogan County Office of Planning and Development, *Conditional Use Permit (CUP)*.
Landowner consent	CUP application	Office of Planning and Development, Okanogan County, MSRF		Included in the CUP application packet. Consent will come from MSRF.	See the section on discussion with Indigenous leaders below. Though this is a form within the packet, it would be valuable to engage the Methow tribe as a landowner by including a separate research report on the topic.	Okanogan County Office of Planning and Development, *Conditional Use Permit (CUP)*.
Memorandum of Understanding (MOU)	Partnership with WWU. Can also be submitted with the CUP application.	MSRF and WWU		This will serve as the main description of WWU's involvement in the project. The MOU explains the terms of the collaboration between MSRFand WWU, including the timeline of the project, how the parties will communicate, and how they will address obstacles.	It would be valuable to explain where funding may come from and how the university will be involved even after the field station community has been constructed.	General information on MOUs: University of Alaska Fairbanks. An example MOU: Western Washington University & Washington Federation of State Employees, 2020.
Water consumption estimate	DOE approval	WA DOE		An estimate of the quantity of water consumed, as well as the quantity that will be restored to the watershed, will strengthen the SEPA checklist application.	Determining the number of units connected to water, as well as the specifications of the faucets, showerheads, and toilets to be used, will make this number more accurate.	Group B water systems information: Washington State Department of Health. More tips on estimating water consumption: Washington State Department of Ecology
Project description	CUP application	Okanogan County		Included in the CUP application packet. Confusion from the planning staff can cause delays, so try to include as much detail as possible.	Can include details from the MOU on WWU's role in the project.	Okanogan County Office of Planning and Development, Conditional Use Permit (CUP).
Site Plan	CUP application	Okanogan County		Provide as many details as possible, including images of the individual units, the greater community layout, and any additional structures. Also include specifics on any necessary building retrofits, roads, or parking spaces.	Consider including the anticipated results of ongoing resoration projects, if any.	Okanogan County Office of Planning and Development, Conditional Use Permit (CUP).
SEPA checklist	Department of Ecology approval	Washington State Department of Ecology	90 days, concurrent w/ CUP app	This is what the Department of Ecology will use to determine to what extent the project will impact the environment. It can be filled out and submitted at the same time as the CUP application.	The SEPA checklist is very detailed and requires extensive knowledge ofthe flora and fauna present on the land. We advise thorough consultation with MSRF, ecologists, and the fire department in order to gather the most accurate details possible.	Okanogan County Office of Planning and Development, Conditional Use Permit (CUP).
Neighbor approval	Submit with the CUP application	Various landowners	Depends on quantity of neighbors, degree of familiarity, and level of opposition (if any).	Submitting the CUP application with neighbor approval is not required but would go a long way towards minimizing delays as the planning staff review the application.	Depending on familiarity with neighbors, could consider preparing some informational materials, like a 1-pager. This can draw from the project description in the CUP application and the environmental impacts in the SEPA checklist.	Use OK county's parcels map on Taxsifter to determine who owns the parcels adjacent to property of interest.
Letter to the Recreation and Conservation Office (RCO)	Preparation for the CUP application	RCO in Olympia, WA	Depends on time taken to write letter.	This step will be necessary for any projects which will make use of land parcels holding state easements. The letter should contain details on how the project will remain consistent with the land's deed of rights.	Be sure to consult the parcel's easement records, and ensure that the project is consistent with *all* of the parcel's easements (if multiple exist).	A copy of the land's deed of rights can be obtained by contacting the Okanogan County Auditor's office.
Recommended: results of research on Indigenous living and/or discussions with Methow leaders	N/A	N/A	Depends on extent of research.	Though not required for the permitting process, including considerations of how the project aligns with Indigenous community lifestyles in the Methow will demonstrate the applicants' dedication to honoring the history of the land and the peoples it belongs to.	If disucssing the project with Methow leaders, make sure to keep them updated and involved for every remaining step of the project. Be careful not to extract their knowledge without offering anything in return. Discussions should be centered on how the project can serve the land and should NOT be had with the goal of gaining approval.	Determined by your research. We recommend visiting the Coleville Confederated Tribes' website and the Methow Valley Interpretive Center.

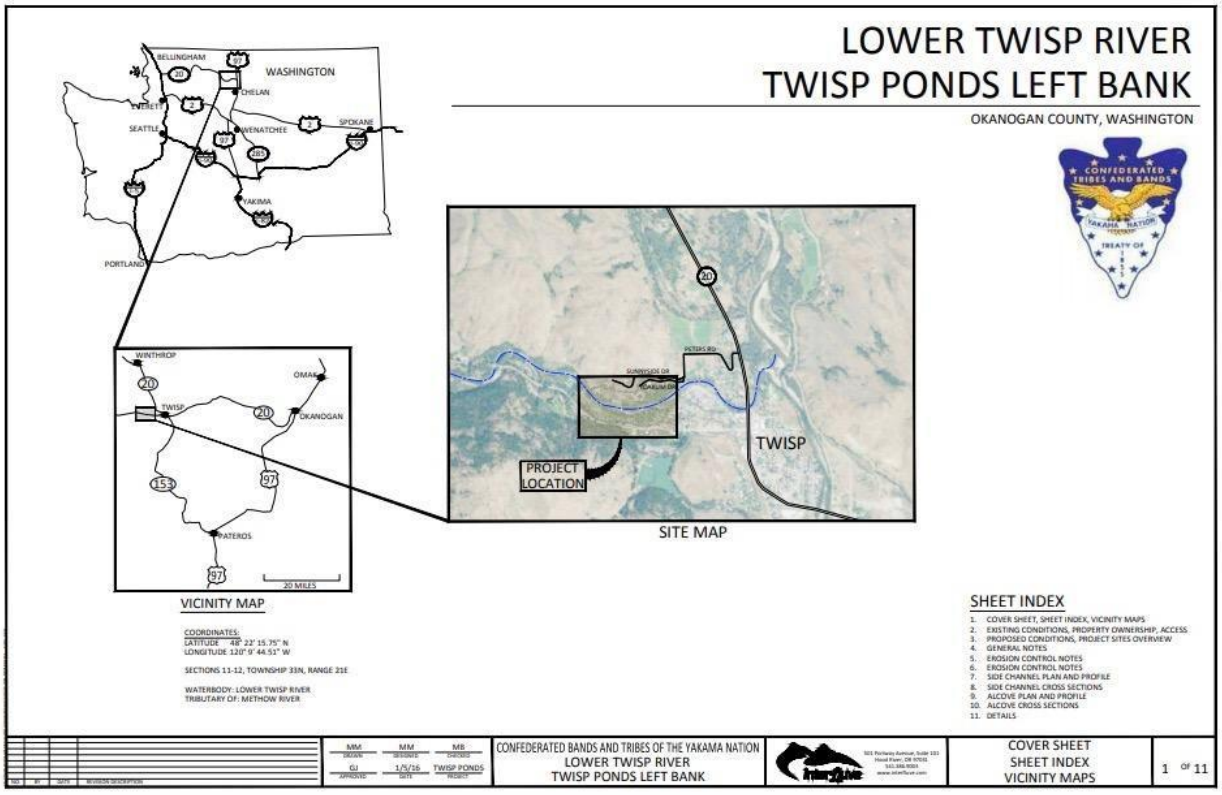


Figure 2: Vicinity Map of the Lower Twips River Twisp Ponds Left Bank. Image: *Twisp Left Bank Planset*

3.3 The Permitting Process

Much of the character of the tiny house community, including the structure of the individual units and the organization of each building, is dependent upon the permits granted for the project as well as the county's zoning regulations. It became clear early on in our research that very few decisions can be made about the physical structures until land use and building permits have been acquired, and we subsequently shifted our goals to prioritize investigations of the permitting process. We began by meeting with Chris Johnson, executive director of MSRF and our main point of contact for the Twisp Ponds land. Johnson advised that a **Conditional Use Permit** (CUP) would be appropriate for this project because it would allow the land to be used differently from how the county's zoning laws have specified. A CUP, when obtained,

A **conditional use permit** allows a parcel of land to be used for purposes other than those specified by its zoning regulation.

A **memorandum of understanding** (MOU) is a written document that outlines the conditions, obligations, goals, and plans for a project between two or more parties.

thus lends the project some flexibility to address the unique requirements of a tiny home community. The application process for such a permit is quite detailed, requires approval from the Washington Department of Health and Department of Ecology, and is reviewed by Okanogan County planning staff with final approval from the county Hearing Examiner. During our initial meeting, Johnson strongly suggested that applicants for the CUP complete extensive legwork before submitting the initial application in order to strengthen the chances of support from the planning staff. Components such as a completed **memorandum of understanding** (MOU) between MSRF and WWU, a letter of approval from the Recreation and Conservation Office regarding land **easements**, adjacent property owners' approvals, and as many building plans as possible can go a long way towards minimizing uncertainties among the planning staff. In total, it can be expected for the process of acquiring a CUP to take three to four months. Figure 3, above, breaks down each individual component of the application and includes details on associated organizations, timeline, and special considerations.

An **easement** is a legal statement that allows a piece of land to be used by a non-possessive, distinct party for specific uses.

If a community wants to approve a compound of tiny houses, they have to be approvable by the city or have a **tag** approved by the Department of Labor and Industries.

We determined that within Okanogan County, building permits are not required for structures with an area of 200 square feet or less. This upper limit fits well with our specifications for small individual units, so we chose to avoid having to acquire building permits simply by planning for our structures to have an area less than 200 square feet. However, tiny homes will need to receive **building tags** from the Washington Department of Labor and Industries in order to be approved by the county.

3.4 Results from the student preferences survey

The student preferences survey was used to investigate which amenities would be prioritized among students representative of future dwellers in the tiny home community. We were also interested in students' attitudes towards shared and individual features, including kitchen access, availability of running water, storage space, internet connection, community social spaces, parking access, proximity to the town of Twisp, and the possibility of roommates. Of the 11 respondents, a majority reported preference for shared kitchen and bathroom spaces with connection to running water rather than individual kitchens and bathrooms without. Students also showed a strong preference for the availability of a communal "hangout" space and expressed the need for nearby parking spaces. Finally, all students have interest in engaging with land stewardship work on and around the property; responses showed that students are willing to commit 2-10 hours each week to work on land restoration projects or assist with MRSF's research and monitoring of the land.

3.5 Building structures and amenities

Based on the guidelines for this project and the responses from our fellow students, we decided a prefabricated option would suit our needs the best. During our search, we emphasized the ability for the tiny homes to be mobile without sacrificing the amenities that were valued amongst our peers. We determined the tiny home manufacturer Tiny Idahomes to be closely aligned with our criteria because of the quality craftsmanship of their structures and the flexibility they provide when customizing their models. They provide two types of customization: 1) Complete customization down to the design of the entire tiny home, and 2) Base models with amenities that can be customized with a range of options. We chose two of their base models to be particularly appealing: the Pioneer and Cascade. Given the amenities customization, we were able to find the ideal build for multiple options.

The Pioneer model is the smaller of the two units (170 sq ft), and is the perfect size for solitary living situations or for acting as a shared kitchen/bathroom unit when paired with one or two Cascade units designed specifically as sleeping/living units. The Cascade comes in at 220 sq ft, making it ideal for a shared sleeping/living unit, when paired up with a shared kitchen/bathroom unit. The Cascade can also come as a fully functioning house with all the needed amenities.

Each bathroom, whether in a shared unit or included in the tiny home itself, comes with a standard toilet and shower which is connected to an on-demand water heater so that hot showers are always available. The kitchen makes efficient use of the space available and comes with a refrigerator (9 cu. ft.), a four burner stove and oven, large sink, and plenty of counter space for all cooking needs. Both units are built according to RV standards and regulations, making them safe for transport to other sites as necessary.

And finally, the yellow barn on the left side of the Twisp Ponds is the only permanent structure on the land. Because it is already connected to the electrical grid and septic, repurposing its existing use would be easier to get a permit approved in the sense that it will have its own permitting process. The barn currently serves a purpose year round for staging and storage. But there is potential to modify that to support seasonal use by interns by improving cooking facilities and sanitation facilities.

Figure 4: Twisp Ponds "Yellow Barn"

Tiny Home Options

	Option 1	Option 2	Option 3
Description	Two people living in a tiny home with full amenities	One person living in a tiny home with full amenities	Two people in a tiny home that share a kitchen/bathroom unit with another tiny home
Number of people accommodated	2	1	4(2 per sleeping unit)
Shared bathroom/kitchen	Yes (with roommate)	No	Yes (with three others)
Which unit from Idahomes is being used	Cascade	Pioneer	Cascade (Sleeping unit), Pioneer (Kitchen/Bathroom)
Total Cost	$52,100	$36,995	$145,933
Cost per person	$26,050	$36,995	$36,483

Figure 5: Details of the tiny home options.

Figure 6: Idahome Cascade custom exterior, Image: *Tiny Idahomes*

Figure 7: Idahome Cascade custom interior, Image: *Tiny Idahomes*

Figure 8: Idahome Pioneer custom exterior, Image: *Tiny Idahomes*

Figure 9: Idahome Pioneer custom interior, Image: *Tiny Idahomes*

As our team collected research and data, we developed a number of recommendations for the mobile tiny homes that could amplify the workings of this project and serve as a guide to similar mobile tiny home field station concepts in the future.

4.1 Sustainable Building Design

It is our intention that the field stations be built such that they are adaptable and can be modified with elements that enhance their sustainability as time and funding allow. Such features include informed structure placement, electricity generation, and energy and water efficiency.

4.1.1 Electricity generation

Following their initial construction, all units in the tiny home community will be connected to electricity through the Okanogan County PUD. The utility provides cheap, low-carbon electricity from hydropower, but the dams' impact on river ecology make them ultimately unsustainable. In addition to emitting little to no greenhouse gases, renewable energy generation adds a layer of resiliency to the electricity grid with minimal impacts to the surrounding ecological systems. Luckily, the town of Twisp averages 189 sunny days every year (BestPlaces) and so, as funding and expertise allow, the community would make great strides towards sustainability by installing photovoltaic units on individual units' rooftops. The feasibility of panel installation should be considered as final decisions are being made on the individual units' structures.

4.1.2 Energy and water efficiency

The majority of energy losses will be experienced through heating and cooling inefficiencies. On average, nearby Winthrop, WA (located 10 miles north of Twisp) experiences 7,233 **heating degree days** and 308 **cooling degree days**, indicating that the tiny homes will require significantly more heating than they will cooling (Climate-Charts.com). Heating losses can be avoided by ensuring that walls and windows are insulated to a high **R-value**, using highly efficient systems such as heat pumps, and strategically orienting units so that a majority of windows are south- or east-facing. The units could also take advantage of the Methow Valley's precipitation, averaging at 16 inches of rain and 58 inches of snow per year (BestPlaces), to passively collect fresh water. Such systems would lessen the burden on the property's two wells and small water rights in addition to assisting in land stewardship initiatives by providing a reliable source of water.

Put simply, **degree days** are a measure of how far a region's temperature deviates from a standard "comfortable" temperature.

An **R-value** is simply a numerical measurement for the level of insulation in a section of wall or window.

4.2 Summary of Housing Options

Each of the three housing options (Figure 5) have their own advantages and disadvantages. The first housing option is ideal for individuals looking to have a roommate yet aren't looking to share a kitchen and bathroom space with many people. The biggest benefits of this option are the cost and the ability to easily move the unit without having to bring another unit along for the bathroom and kitchen. The second option is suited for someone needing to live on their own, it's the most expensive and would require the most number of units hooked up to water on a per person basis. The third option is great for building a community as it incorporates the kitchen/bathroom unit which is shared amongst two sleeping/living units. While it costs significantly more than the first option, it doesn't require as many units to be hooked up to water which will save money and be simpler to set up. The best community set up is most likely a mix of these options, which will accommodate for personal preferences as each of these options can easily fit in with one another.

4.3 Addressing the Housing Crisis in the Methow Valley

The Methow Valley is experiencing a well known housing crisis, making it difficult to find sustainable housing options for WWU student interns. The purpose of this project is to house student interns working on sustainable initiatives throughout the Valley for eight months in seasonal living communities. The model and recommendations we provide also have the potential to be replicated for other temporary housing uses, such housing as a youth climate corps or displaced victims of natural disasters.

4.3.1 Youth Climate Corps based out of the Methow Valley

Organizations within the Methow Valley are considering implementing a Youth Climate Corps program, in which local high-school-aged students could participate in restoration and fire-prevention work to mitigate the consequences of climate change in their homes. Such a corps could be housed in a pod adjacent to the WWU student interns during the 8-month growing season. For example, the south side of the river could house the youth climate corps while the other side could house the WWU interns. While the mobile field station would offer the corps flexibility in moving their equipment and living spaces, the Twisp Ponds land would serve as a convenient base due to its proximity to town and numerous restoration work opportunities.

4.3.2 Displaced victims of natural disasters

Because of the high risk of wildfires in the summer, there is always a high chance of many community members being displaced by fire. Yet due to the lack of available housing options, it is oftentimes extremely difficult for natural disasters. Because of the mobile aspect of the tiny home field station model, a similar concept could be replicated in the Methow Valley for displaced victims of natural disasters. Groups like the Federal Emergency Management Agency

(FEMA), or Room One (which is part of the Methow Valley Long-Term Recovery Group) could collaborate in order to evaluate a system of assessing which community members are at most risk and therefore are placed in an applicant pool.

The variety of alternative needs this project could fill within different parts of the community speak to its adaptability and value in the Methow. For the future of this project, determining exactly which application would best suit stakeholders' needs is a matter of maintaining conversations with the Methow Salmon Recovery Foundation, WWU, and community leaders.

4.4 Field Station Layout

The mobile field station would be oriented in a way that would build relationships between all residents. The layout would be designed to encourage interaction year round, with walkable trails connecting units, and shared activities and facilities. The Twisp Ponds property is naturally populated by dense bushes and trees, which will offer some degree of privacy to each of the units. Moreover, the addition of trails and walkways will create natural boundaries without having to construct fences that would take away from a shared community environment. The added benefits of the mobility aspect of the tiny homes allow for multiple layout options that can be modified over time if needed. The image below shows an example of the community layout we envision.

Figure 10: Example layout for field station, Image from topcommunitygrants.com

4.4.1 Community-building spaces

The design of the mobile field station will be made conducive to the Community Learning Lab's goals for collaborative, place-based learning by including numerous gathering spaces. An indoor space with couches, tables, bookshelves, and games would be an ideal place to meet, chat, study, and play by providing ample space for groups. The area could also serve as an additional escape from the wildfire smoke that is becoming commonplace during the summer fire season. This space will strengthen the relationships of cohort members by encouraging daily interactions; it will be a space both to relax and to have fun. Likewise, the addition of a shared outdoor space in this design is intended to serve as a relaxing place for the students in the cohort to enjoy the beautiful Twisp Ponds Property or cool off in the hot summer months. Given the constraints of living in a tiny home, benches and shaded areas will provide some much-needed fresh air and improve the quality of life at the field station.

4.4.2 Shared gear locker

Student responses to our intake survey indicated that a covered gear storage space would be convenient due to the limited storage space in the tiny homes themselves. Because the

Methow Valley is home to many outdoor recreation opportunities, the gear storage space would have to be large enough to hold multiple bikes, paddle boards, kayaks, inner tubes, backpacking gear, etc. Students who are involved in field based work could also store their field gear here.

4.4.3 Shared kitchen

Many student survey respondents indicated that a shared kitchen would be ideal for their personal preferences. From our team's view, a shared kitchen space would also be ideal in terms of budgeting because it would mean that not every tiny home would have to include a full kitchen setup, therefore costing less for the build price and the potential to use utilities.

4.4.4 Inspiration from Indigenous communities

In considering the community layout, we would also like to take inspiration from the local aboriginal peoples of the Methow Valley. Prior to Canadian and European settlers' arrival in the Methow, Indigenous peoples "were nomadic, following the seasons of nature and their sources of food", (C.C.T, 2021). The adaptability of having a home on wheels allows this tiny community to serve many needs in various areas as the challenges faced by the Methow Valley evolve. These tribes were also known to thrive off gatherings, including for a wide variety of activities like harvesting, feasting, trade, and celebrations with sports and gambling. The field station would be built with this idea of gathering and socializing in consideration: the layout should mirror the purpose of having a field station with a gathering space for the community members to share and learn from each other while engaging in work for sustainability. These social opportunities will strengthen the community's sense of togetherness as well as individual students' mental health.

Connection to the Eco-Share Project

The CSPS project in summer 2020 also in the Methow Valley, called the Eco-Share House, already included details on a preferred kitchen setup (Myers et al., 2020). Although their report was focused around one large house that could sustain eight people, the application for kitchen needs is similar to our own project's with a shared kitchen space. In their project, they included a few elements that they believed would be beneficial in a kitchen layout, including:

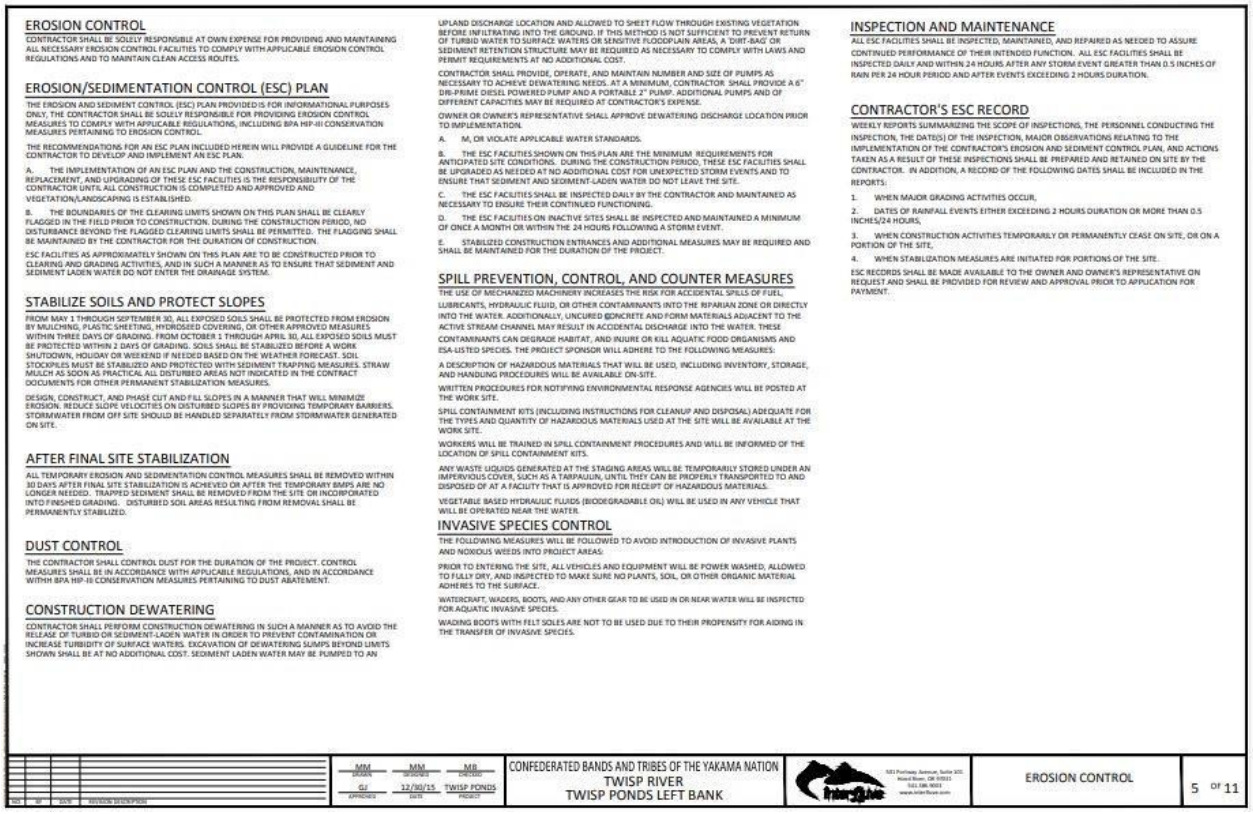
- Two fridges to deter confusion and conflict around food, and to accommodate food restrictions or allergies
- Ample cabinet space so cohort members can have their own personal places to store food
- Deep sinks to facilitate easy dish washing
- Quality pots and pans to encourage cooking
- Provided staple ingredients upon arrival of cohort (locally sourced, if possible) including oil, salt and pepper, flour, sugar, dried beans, and rice.

As previously mentioned, the community layout of the mobile field station would include a shared gathering space and a shared outdoor space, as well as a shared kitchen setup. These layout design elements are intended to foster a sense of community within the cohort and improve quality of life for the length of the program. Not only this, but the possibility of hosting dinners with project sponsors, internship supervisors, and other community members would be possible in the shared gathering spaces. This is an important piece of the Community Learning Lab experience because spending time outside of work with community members builds meaningful relationships, demonstrates respect, encourages learning, and strengthens connection to a physical place. Place-based knowledge is a key component of the Community Learning Lab experience.

4.5 Sustainable Land Stewardship

Located about a half mile out of Twisp on Twisp River Road, the Twisp Ponds site is a complex system of streams, trails, rearing ponds, and riparian vegetation. The land also features public art and interpretive stations that educate visitors on the steelhead trout populations, spring Chinook Salmon, and Coho salmon (Methow Arts, 2021).

Twisp Ponds land borders both sides of the Twisp River. Along the length of the property, channels and ponds have been reconnected to the Twisp River, benefitting the recovery of the endangered spring Chinook salmon and threatened steelhead and bull trout. The Twisp Left Bank Restoration project, for example, included erosion control efforts like soil stabilization, dust control, and slope protection (see figure 12). The restoration efforts conducted by the Methow Salmon Recovery Foundation have also provided an important habitat for other native fish species, aquatic and terrestrial plants, and animals (Methow Salmon Recovery Foundation, 2021).



EROSION CONTROL

CONTRACTOR SHALL BE SOLELY RESPONSIBLE AT OWN EXPENSE FOR PROVIDING AND MAINTAINING ALL NECESSARY EROSION CONTROL FACILITIES TO COMPLY WITH APPLICABLE EROSION CONTROL REGULATIONS AND TO MAINTAIN CLEAN ACCESS ROUTES.

EROSION/SEDIMENTATION CONTROL (ESC) PLAN

THE EROSION AND SEDIMENT CONTROL (ESC) PLAN PROVIDED IS FOR INFORMATIONAL PURPOSES ONLY. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR PROVIDING EROSION CONTROL MEASURES TO COMPLY WITH APPLICABLE REGULATIONS, INCLUDING BPA HIP-III CONSERVATION MEASURES PERTAINING TO EROSION CONTROL.

THE RECOMMENDATIONS FOR AN ESC PLAN INCLUDED HEREIN WILL PROVIDE A GUIDELINE FOR THE CONTRACTOR TO DEVELOP AND IMPLEMENT AN ESC PLAN.

A. THE IMPLEMENTATION OF AN ESC PLAN AND THE CONSTRUCTION, MAINTENANCE, REPLACEMENT, AND UPGRADING OF THESE ESC FACILITIES IS THE RESPONSIBILITY OF THE CONTRACTOR UNTIL ALL CONSTRUCTION IS COMPLETED AND APPROVED AND VEGETATION/LANDSCAPING IS ESTABLISHED.

B. THE BOUNDARIES OF THE CLEARING LIMITS SHOWN ON THIS PLAN SHALL BE CLEARLY FLAGGED IN THE FIELD PRIOR TO CONSTRUCTION. DURING THE CONSTRUCTION PERIOD, NO DISTURBANCE BEYOND THE FLAGGED CLEARING LIMITS SHALL BE PERMITTED. THE FLAGGING SHALL BE MAINTAINED BY THE CONTRACTOR FOR THE DURATION OF CONSTRUCTION.

ESC FACILITIES AS APPROXIMATELY SHOWN ON THIS PLAN ARE TO BE CONSTRUCTED PRIOR TO CLEARING AND GRADING ACTIVITIES, AND IN SUCH A MANNER AS TO ENSURE THAT SEDIMENT AND SEDIMENT LADEN WATER DO NOT ENTER THE DRAINAGE SYSTEM.

STABILIZE SOILS AND PROTECT SLOPES

FROM MAY 1 THROUGH SEPTEMBER 30, ALL EXPOSED SOILS SHALL BE PROTECTED FROM EROSION BY MULCHING, PLASTIC SHEETING, HYDROSEED COVERING, OR OTHER APPROVED MEASURES WITHIN THREE DAYS OF GRADING. FROM OCTOBER 1 THROUGH APRIL 30, ALL EXPOSED SOILS MUST BE PROTECTED WITHIN 2 DAYS OF GRADING. SOILS SHALL BE STABILIZED BEFORE A WORK SHUTDOWN, HOLIDAY OR WEEKEND IF NEEDED BASED ON THE WEATHER FORECAST. SOIL STOCKPILES MUST BE STABILIZED AND PROTECTED WITH SEDIMENT TRAPPING MEASURES. STRAW MULCH AS SOON AS PRACTICAL ALL DISTURBED AREAS NOT INDICATED IN THE CONTRACT DOCUMENTS FOR OTHER PERMANENT STABILIZATION MEASURES.

DESIGN, CONSTRUCT, AND PHASE CUT AND FILL SLOPES IN A MANNER THAT WILL MINIMIZE EROSION. REDUCE SLOPE VELOCITIES ON DISTURBED SLOPES BY PROVIDING TEMPORARY BARRIERS. STORMWATER FROM OFF SITE SHOULD BE HANDLED SEPARATELY FROM STORMWATER GENERATED ON SITE.

AFTER FINAL SITE STABILIZATION

ALL TEMPORARY EROSION AND SEDIMENTATION CONTROL MEASURES SHALL BE REMOVED WITHIN 30 DAYS AFTER FINAL SITE STABILIZATION IS ACHEIVED OR AFTER THE TEMPORARY BMPS ARE NO LONGER NEEDED. TRAPPED SEDIMENT SHALL BE REMOVED FROM THE SITE OR INCORPORATED INTO FINISHED GRADING. DISTURBED SOIL AREAS RESULTING FROM REMOVAL SHALL BE PERMANENTLY STABILIZED.

DUST CONTROL

THE CONTRACTOR SHALL CONTROL DUST FOR THE DURATION OF THE PROJECT. CONTROL MEASURES SHALL BE IN ACCORDANCE WITH APPLICABLE REGULATIONS, AND IN ACCORDANCE WITHIN BPA HIP-III CONSERVATION MEASURES PERTAINING TO DUST ABATEMENT.

CONSTRUCTION DEWATERING

CONTRACTOR SHALL PERFORM CONSTRUCTION DEWATERING IN SUCH A MANNER AS TO AVOID THE RELEASE OF TURBID OR SEDIMENT-LADEN WATER IN ORDER TO PREVENT CONTAMINATION OR INCREASE TURBIDITY OF SURFACE WATERS. EXCAVATION OF DEWATERING SUMPS BEYOND LIMITS SHOWN SHALL BE AT NO ADDITIONAL COST. SEDIMENT LADEN WATER MAY BE PUMPED TO AN UPLAND DISCHARGE LOCATION AND ALLOWED TO SHEET FLOW THROUGH EXISTING VEGETATION BEFORE INFILTRATING INTO THE GROUND. IF THIS METHOD IS NOT SUFFICIENT TO PREVENT RETURN OF TURBID WATER TO SURFACE WATERS OR SENSITIVE FLOODPLAIN AREAS, A 'DIRT-BAG' OR SEDIMENT RETENTION STRUCTURE MAY BE REQUIRED AS NECESSARY TO COMPLY WITH LAWS AND PERMIT REQUIREMENTS AT NO ADDITIONAL COST.

CONTRACTOR SHALL PROVIDE, OPERATE, AND MAINTAIN NUMBER AND SIZE OF PUMPS AS NECESSARY TO ACHIEVE DEWATERING NEEDS. AT A MINIMUM, CONTRACTOR SHALL PROVIDE A 6" DIR-PRIME DIESEL POWERED PUMP AND A PORTABLE 2" PUMP. ADDITIONAL PUMPS AND OF DIFFERENT CAPACITIES MAY BE REQUIRED AT CONTRACTOR'S EXPENSE.

OWNER OR OWNER'S REPRESENTATIVE SHALL APPROVE DEWATERING DISCHARGE LOCATION PRIOR TO IMPLEMENTATION.

A. M, OR VIOLATE APPLICABLE WATER STANDARDS.

B. THE ESC FACILITIES SHOWN ON THIS PLAN ARE THE MINIMUM REQUIREMENTS FOR ANTICIPATED SITE CONDITIONS. DURING THE CONSTRUCTION PERIOD, THESE ESC FACILITIES SHALL BE UPGRADED AS NEEDED AT NO ADDITIONAL COST FOR UNEXPECTED STORM EVENTS AND TO ENSURE THAT SEDIMENT AND SEDIMENT-LADEN WATER DO NOT LEAVE THE SITE.

C. THE ESC FACILITIES SHALL BE INSPECTED DAILY BY THE CONTRACTOR AND MAINTAINED AS NECESSARY TO ENSURE THEIR CONTINUED FUNCTIONING.

D. THE ESC FACILITIES ON INACTIVE SITES SHALL BE INSPECTED AND MAINTAINED A MINIMUM OF ONCE A MONTH OR WITHIN THE 24 HOURS FOLLOWING A STORM EVENT.

E. STABILIZED CONSTRUCTION ENTRANCES AND ADDITIONAL MEASURES MAY BE REQUIRED AND SHALL BE MAINTAINED FOR THE DURATION OF THE PROJECT.

SPILL PREVENTION, CONTROL, AND COUNTER MEASURES

THE USE OF MECHANIZED MACHINERY INCREASES THE RISK FOR ACCIDENTAL SPILLS OF FUEL, LUBRICANTS, HYDRAULIC FLUID, OR OTHER CONTAMINANTS INTO THE RIPARIAN ZONE OR DIRECTLY INTO THE WATER. ADDITIONALLY, UNCURED CONCRETE AND FORM MATERIALS ADJACENT TO THE ACTIVE STREAM CHANNEL MAY RESULT IN ACCIDENTAL DISCHARGE INTO THE WATER. THESE CONTAMINANTS CAN DEGRADE HABITAT, AND INJURE OR KILL AQUATIC FOOD ORGANISMS AND ESA-LISTED SPECIES. THE PROJECT SPONSOR WILL ADHERE TO THE FOLLOWING MEASURES:

A DESCRIPTION OF HAZARDOUS MATERIALS THAT WILL BE USED, INCLUDING INVENTORY, STORAGE, AND HANDLING PROCEDURES WILL BE AVAILABLE ON-SITE.

WRITTEN PROCEDURES FOR NOTIFYING ENVIRONMENTAL RESPONSE AGENCIES WILL BE POSTED AT THE WORK SITE.

SPILL CONTAINMENT KITS (INCLUDING INSTRUCTIONS FOR CLEANUP AND DISPOSAL) ADEQUATE FOR THE TYPES AND QUANTITY OF HAZARDOUS MATERIALS USED AT THE SITE WILL BE AVAILABLE AT THE WORK SITE.

WORKERS WILL BE TRAINED IN SPILL CONTAINMENT PROCEDURES AND WILL BE INFORMED OF THE LOCATION OF SPILL CONTAINMENT KITS.

ANY WASTE LIQUIDS GENERATED AT THE STAGING AREAS WILL BE TEMPORARILY STORED UNDER AN IMPERVIOUS COVER, SUCH AS A TARPAULIN, UNTIL THEY CAN BE PROPERLY TRANSPORTED TO AND DISPOSED OF AT A FACILITY THAT IS APPROVED FOR RECEIPT OF HAZARDOUS MATERIALS.

VEGETABLE BASED HYDRAULIC FLUIDS (BIODEGRADABLE OIL) WILL BE USED IN ANY VEHICLE THAT WILL BE OPERATED NEAR THE WATER.

INVASIVE SPECIES CONTROL

THE FOLLOWING MEASURES WILL BE FOLLOWED TO AVOID INTRODUCTION OF INVASIVE PLANTS AND NOXIOUS WEEDS INTO PROJECT AREAS:

PRIOR TO ENTERING THE SITE, ALL VEHICLES AND EQUIPMENT WILL BE POWER WASHED, ALLOWED TO FULLY DRY, AND INSPECTED TO MAKE SURE NO PLANTS, SOIL, OR OTHER ORGANIC MATERIAL ADHERES TO THE SURFACE.

WATERCRAFT, WADERS, BOOTS, AND ANY OTHER GEAR TO BE USED IN OR NEAR WATER WILL BE INSPECTED FOR AQUATIC INVASIVE SPECIES.

WADING BOOTS WITH FELT SOLES ARE NOT TO BE USED DUE TO THEIR PROPENSITY FOR AIDING IN THE TRANSFER OF INVASIVE SPECIES.

INSPECTION AND MAINTENANCE

ALL ESC FACILITIES SHALL BE INSPECTED, MAINTAINED, AND REPAIRED AS NEEDED TO ASSURE CONTINUED PERFORMANCE OF THEIR INTENDED FUNCTION. ALL ESC FACILITIES SHALL BE INSPECTED DAILY AND WITHIN 24 HOURS AFTER ANY STORM EVENT GREATER THAN 0.5 INCHES OF RAIN PER 24 HOUR PERIOD AND AFTER EVENTS EXCEEDING 2 HOURS DURATION.

CONTRACTOR'S ESC RECORD

WEEKLY REPORTS SUMMARIZING THE SCOPE OF INSPECTIONS, THE PERSONNEL CONDUCTING THE INSPECTION, THE DATE(S) OF THE INSPECTION, MAJOR OBSERVATIONS RELATING TO THE IMPLEMENTATION OF THE CONTRACTOR'S EROSION AND SEDIMENT CONTROL PLAN, AND ACTIONS TAKEN AS A RESULT OF THESE INSPECTIONS SHALL BE PREPARED AND RETAINED ON SITE BY THE CONTRACTOR. IN ADDITION, A RECORD OF THE FOLLOWING DATES SHALL BE INCLUDED IN THE REPORTS:

1. WHEN MAJOR GRADING ACTIVITIES OCCUR,
2. DATES OF RAINFALL EVENTS EITHER EXCEEDING 2 HOURS DURATION OR MORE THAN 0.5 INCHES/24 HOURS,
3. WHEN CONSTRUCTION ACTIVITIES TEMPORARILY OR PERMANENTLY CEASE ON SITE, OR ON A PORTION OF THE SITE,
4. WHEN STABILIZATION MEASURES ARE INITIATED FOR PORTIONS OF THE SITE.

ESC RECORDS SHALL BE MADE AVAILABLE TO THE OWNER AND OWNER'S REPRESENTATIVE ON REQUEST AND SHALL BE PROVIDED FOR REVIEW AND APPROVAL PRIOR TO APPLICATION FOR PAYMENT.

NO.	BY	DATE	REVISION DESCRIPTION	MM DRAWN	MM DESIGNED	MB CHECKED	CONFEDERATED BANDS AND TRIBES OF THE YAKAMA NATION TWISP RIVER TWISP PONDS LEFT BANK	EROSION CONTROL	5 OF 11
				GJ APPROVED	12/30/15 DATE	TWISP PONDS PROJECT			

Figure 11: Erosion control notes on the Lower Twisp River Twisp Ponds Left Bank Restoration Project
Image: *Twisp Left Bank Planset*

In speaking with Chris Johnson, the executive director at MSRF, a partnership with WWU and MSRF in creating and maintaining options for land stewardship seemed like a very reasonable outcome of student life at the mobile field station. Johnson says there are many areas on the land that are in need of improvement. Looking at some of the land stewardship and monitoring activities that already have taken place on the Twisp Ponds land via MSRF, our team recommends that students participate in some of the following activities as part of a place-based curriculum and demonstration of respect for the land they live on.

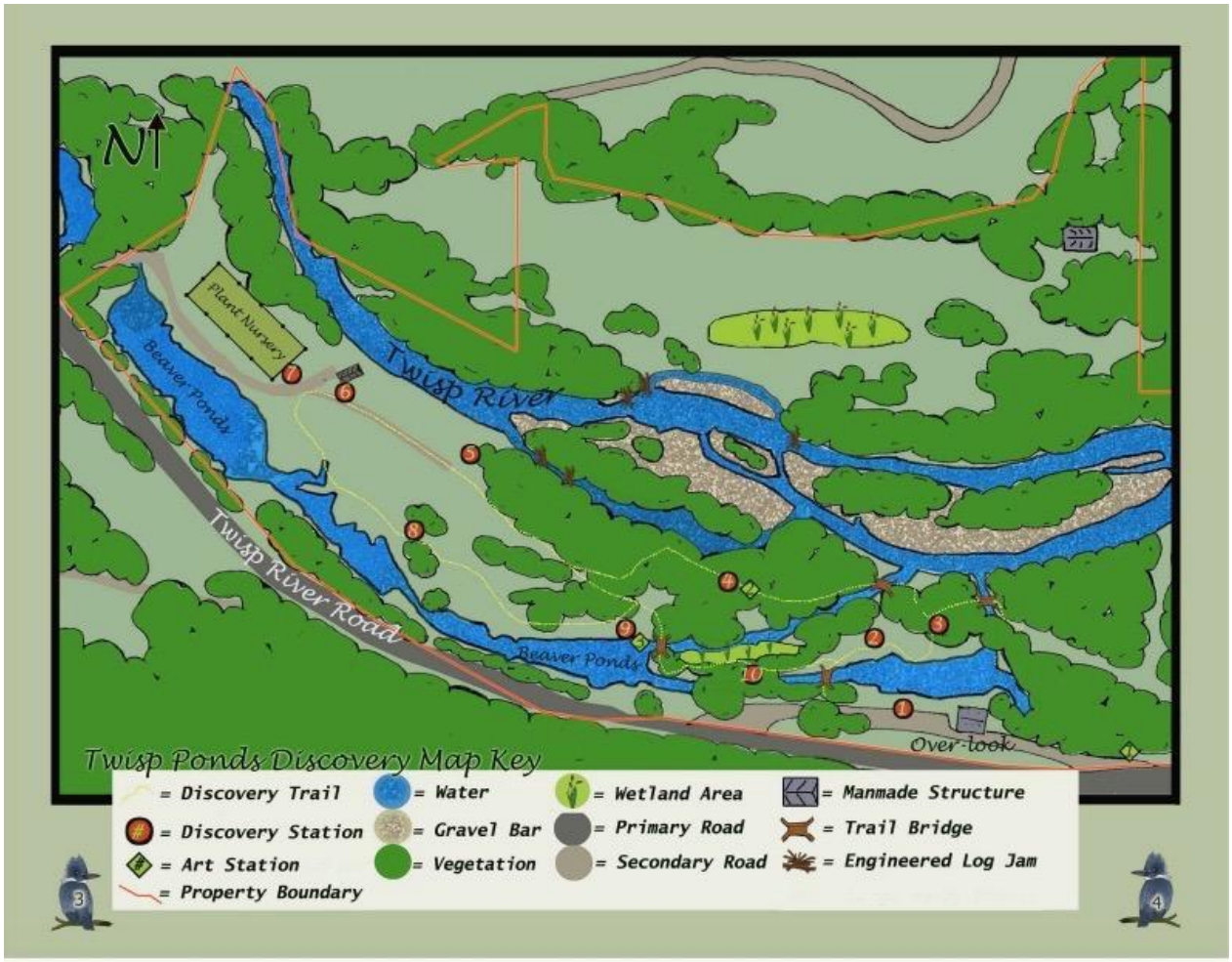


Figure 12: Twisp Ponds Map Key, Image: *Twisp Ponds Trail Discovery Guide*

4.5.1 Trail maintenance

As the Twisp Ponds map key shows above, there are many trails on the land that need to be maintained. Further, once the tiny homes are constructed, either students or the Youth Climate Corps could have the opportunity to establish new trails connecting each tiny home to the shared kitchen and bathroom, parking, and as to each other.

4.5.2 Native plant monitoring and invasive species control

As previously mentioned, the riparian restoration efforts at Twisp Pond included bringing back more native plants into the area. The common plants include red osier dogwood, black cottonwood, quaking aspen, willow, rose, hawthorn, and mock orange. Further, Canary grass is an invasive species at Twisp Ponds land, which folks at MSRF have been trying to crowd and shade out for years. Student plant monitoring efforts would be essential to measuring the success of MSRF's restoration project. Monitoring could include counting and documenting the amount of each native plant species and evaluating the efficacy of various strategies to control native plant species populations. Students could also participate in identifying invasive species and

weeding them when necessary. For a guide to the most common weeds in the Methow Valley, follow this link: https://methowconservancy.org/weed-guide (Methow Conservancy, n.d.).

4.5.3 Salmon restoration

Given the relationship of the Twisp Ponds land to MSRF, the opportunity for students to engage in salmon recovery and restoration efforts would be very feasible. Salmon restoration projects would include activities such as barrier removal, riparian planting, and floodplain connection. These activities would be in direct engagement with MSRF.

4.5.4 Monitoring of terrestrial and aquatic life

The Twisp Ponds land is home to many species of wildlife: common species of fish include Rainbow trout/steelhead, Coho salmon, Chinook salmon, Bridgelip sucker, Longnose dace, and Mountain whitefish. Bird species include the Belted kingfisher, Osprey, American robin, Mallard, Great blue heron, and Northern oriole. Common mammal species include the White tailed deer, mule deer, beaver, and mink (Methow Salmon Recovery Foundation, 2021). One example of monitoring of terrestrial life would be working with the Methow Beaver Project, which MSRF has worked with before, to create post assisted log structures. These are essentially human-created beaver dam analogs which help create a more complex micro habitat for fish. Chris Johnson recommended that someone who implemented these log structures previously could walk the site with students and explain what they are happy with while also explaining what they wish to change.

Students with environmental science backgrounds who are interested in aquatic ecology or salmon could have the opportunity to participate in monitoring of underwater life. Monitoring takes place to observe the condition of the fish and their habitat so that MSRF can better understand their condition and how it changes over time. It also helps to document how fish are responding to the various restoration projects which are designed for their benefit. These studies could take on the form of counting, measuring, and identifying many factors that affect fish and their habitat including water temperature, fish species and abundance, and riparian plant community structures. Hopefully, these monitoring efforts would assess the fish population size in a way that would warrant their removal from the endangered species list.

Figure 13: (after) photos of the same location show the results of restoration efforts below the Twisp Ponds overlook. Image: *Twisp Ponds Trail Discovery Guide*

Figure 14: Twisp ponds, (Before) photos of the same location show the results of restoration efforts below the Twisp Ponds overlook. Image: *Twisp Ponds Trail Discovery Guide*

4.6 Timeline

The timeline for this project depends on its two main components: the permitting process and the building process. Once submitted, the CUP application process can be expected to take three to four months. However, the detailed pre-application research steps, which can be found in our permitting breakdown chart (see figure 3), could add weeks or even months to that timeframe. Even so, these preemptive steps will go a long way towards avoiding time-consuming delays and confusions while the CUP application is being reviewed by the planning staff. In many ways the timeline for the building process is informed by the results of permitting: the county's decisions regarding the number of units to be allowed, the extent to which the land must be developed, and the project's ability to connect to water and electricity will determine the time needed to complete the physical structures of the project. Once an order has been placed with Idahomes the build time is usually between 6-8 weeks, once it is completed it can be shipped to Twisp. Plans for the retrofitting of the Yellow Barn should also be considered.

4.7 Connection to Systems Thinking

The current housing crisis locally in the Methow Valley and regionally in other parts of the county points to the need for creative housing solutions. The complexity of this issue demands a systemic approach to housing student interns in the future without placing a burden on those who are in greatest need of a place to live. A sustainable community is one whose actions don't diminish social opportunities and the health of an ecosystem for future generations. In this way, the project goal of creating housing options for interns without taking away housing options for the local workforce and community members is accomplished with our recommendations. The mobile field station is unique because influential decision makers can be encouraged to develop similar agendas for sustainable living systems like the one we have designed. Further, our project provides a flexible funding model that can be scaled up or down depending on what any other stakeholders decide to include in their own version of a mobile tiny home field station, if ever replicated. And finally, the data we have shared promotes access about the planning process one must go through to accomplish such a field station in the region. These different aspects of our project show how systems thinking is applied in a beneficial way to encourage more sustainable communities locally, regionally, and nationally.

5. Monitoring and Evaluation

5.1 Strategies for Determining Success

The actualization of the mobile field station will be possible with the continuation of this project after we provide our recommendations. However, there are many steps that must be taken by those who continue on this project until the construction of the tiny houses begins. For example, more planning and benchmarking tiny house options based on further details one may acquire with the continuation of this project will be crucial to the project's success. Further, to measure the sustainable design component of the tiny house design, the use of water, gas, power, and building materials will provide metrics for evaluating the success of the project goal of sustainable design.

Beyond the physical aspects of construction of the field station, another important aspect of a successful project includes the well-being of the community that will live there. Residents of the field station in an ideal setting would maintain good morale, enthusiasm, productivity, and positivity. One way of measuring this is by providing each member of the WWU cohort with an evaluation of their residency experience. This evaluation would be anonymous and would contain questions on quality of living in the tiny homes, and offer space for critiques. These evaluations could then be reviewed by the program manager and would be thoughtfully taken into account for future cohorts.

Finally, monitoring of the land stewardship on the Twisp Ponds property would be essential to evaluate the efficiency of students carrying out land stewardship activities previously mentioned, including: trail building, salmon habitat restoration, invasive plant control, wildlife surveys, and forest management to reduce fire risk and increase forest health. A simple observation spreadsheet could accomplish the data collection aspect of these activities. Students could enter the date, their name, the event they took part in, and their observations. This would allow for the all around ecosystem health of the property to be tracked in a comprehensive way.

6.1 Developing a flexible budget

Because the Mobile Field Station is in the preliminary stages of concept development, there is not yet a concrete budget available. Based on our results and recommendations of both the cost of multiple tiny houses and the cost of permit approval and site review, we can only provide ideas on the budget range from most expensive to least expensive. Further, budget considerations will also have to be made in the future for the costs of utilities like water, electricity, sewage, trash collection, and any other technological expenses.

The cost for the housing units themselves varies depending on what option is selected. The most cost effective housing option is having pairs living in fully built out Cascade models, costing around $26,000 per person before utilities. The other two options including the solo living option in the Pioneer and the shared kitchen/bathroom space for two Cascades cost about the same amount on a per person level: around $36,000. An advantage to the shared bathroom/kitchen option is that it only needs to connect one unit to water for the four people using the space, which could save a significant amount of money, depending on the cost of connecting units to water, and should be considered when making a decision on a financial basis.

Initial conversations with stakeholders and our program sponsor indicate that potential funding could come from multiple places, including the co-sponsor Methow Salmon Recovery Foundation, a WWU grant, or the Covid Relief Fund for housing in the Valley. Additional sources of revenue could come from renting the tiny home units out during the winter season to seasonal workers, as previously stated.

The need for long-term student housing in the Methow Valley provides the opportunity of doing so in a way that is sustainable and correlates to the UN Sustainable Development Goals. The mobile tiny house field station is a sustainable solution to housing WWU Campus Sustainability Planning Studio students in the midst of an ongoing housing crisis in the Methow Valley. Our recommendations for a mobile tiny home field station allow for student interns to experience the Twisp Ponds land in a meaningful way, with opportunities for community building and lasting land stewardship. We provide a range of options for the building structure of tiny houses, along with a budget scale so that we can easily convey the benefits of each different type of structure depending on what future stakeholders of this project are looking for exactly. By providing guidelines for the permitting process of building a mobile tiny home, we also have created a guide for future stakeholders to follow once more details become flushed out. These guidelines can also serve as a template for a similar concept to be used for other community groups, such as displaced victims of natural disasters or a youth climate corps. The mobile tiny home field station models how mobile tiny home living can set a standard of living or even change our understanding of size of living and sustainability as a creative solution to community housing needs.

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Appendices

Glossary

Throughout our research, we came across a number of vocabulary terms specific to the permitting and building processes which were unfamiliar. For the readers' convenience, we have briefly defined those words below.

Easement: An easement is a legal statement that allows a piece of land to be used by a non-possessive, distinct party for specific uses. (QuickenLoans, *What is an Easement? Everything You Need To Know*). For instance, a conservation easement is usually seen as an agreement between a landowner and a land trust which defines which uses are or aren't allowed for the relevant piece of land, with the goal of protecting the land from negative environmental impacts (Whatcom Land Trust).

Zoning: Municipalities use zoning laws to divide areas of land into different uses, such as residential, commercial, and industrial. Zoning codes are rules that dictate how a given piece of land can and cannot be used, and they often restrict what types of structures can be built on it (QuickenLoans, *Zoning: What It Is And How To Understand Zoning Codes*).

Memorandum of Understanding (MOU): A memorandum of understanding is a written document that outlines the conditions, obligations, goals, and plans for a project between two or more parties. The document does not serve as a legally binding contract, but rather serves as a guide for the parties to understand each others' expectations throughout the project. For the tiny home community, an MOU will be written between MSRF and WWU (University of Alaska Fairbanks).

Building tag: All prefabricated homes have to go through a licensing process. If a community wants to approve a compound of tiny houses, they have to be approvable by the city or have a tag approved by the Department of Labor and Industries. Mobile Tiny home kits should be already tagged and ready to go.

Conditional Use Permit (CUP): A conditional use permit allows a parcel of land to be used for purposes other than those specified by its zoning regulation. This flexibility is necessary for a project such as this one, which has very specific needs that are not addressed by county-wide zoning codes.

R-value: An R-value is simply a numerical measurement for the level of insulation in a section of wall or window. A higher R-value indicates that the material has a greater ability to resist

conductive heat flow. Buildings with high R-values stay warm on cold winter days and cool on hot summer days (Energy Saver).

Heating and cooling degree days: Put simply, degree days are a measure of how far a region's temperature deviates from a standard "comfortable" temperature. Degree days are calculated by finding the difference between a daily mean temperature and the standard temperature (usually 65 ℉) and are added together over a period of time. Days where the average temperature was above 65 ℉ are considered cooling degree days, and the opposite is true for heating degree days. For instance, a region that experiences a temperature of 85 ℉on one day and 90 ℉ on the following day has seen 45 cooling degree days in that period of time. Knowing the region's number of degree days helped us determine whether to prioritize heating or cooling systems in the tiny homes (U.S. Energy Information Administration).

Interviews

Chris Johnson, MSRF Executive Director
Date: 07/30/2021

We chose to interview Chris because he is knowledgeable about the Twisp Ponds land, which is our team's first choice for the mobile field station location. Chris has recently reached out to the County to find more info on the water, septic, and building permitting process which will be the bulk of our research focus for the project.

Questions for Chris:

1. **Do you have any information on permitting/zoning on this piece of land? In general can you tell us about who owns the property, etc?**
    a. Tiny houses are a gray area because of their permanence and if people are living inside of them.
    b. Tiny homes need to be tagged (built on trailers, people living in them). Chris suggests finding out the hurdle that we have to go through to get the magic tag of approval on them. The Department of Labor and industries regulate mobile homes, RVS, and manufacturers homes.
    c. Size is irrelevant as long as it is less than 200 sq. ft. As soon as you want to live on it, it requires a building permit.
    d. A yurt is technically a temporary structures
2. **What are the specific water and power amenities on this piece of land? How much water is available on the land? How many wells are on the land?**
    a. The 1976 RCW 173 548 led to a water moratorium, so water will probably be our biggest challenge for this project.

b. There are two domestic exempt wells and a small water right on the yellow barn at Twisp Ponds, on the south side of the river is a small exempt well and we could argue to DOE about more water.
c. We would want to get a conditional use permit (CUP), which would allow us to be on the land for multiple years, versus a temporary use permit (TUP) which would only allow us to be on the land for a year and we would have to move.
d. The Legislature says except wells allow for 5,000 gallons of use. The piece of land currently does not use all 5,000 gallons.
e. The Department of Health (DOH) monitors how you use the water. The Department of Ecology (DOE) monitors if you can use water (rights, exemptions, other than domestic uses).
f. A support structure type project would be more feasible than each structure having water. Chris thinks that DOH will be fine with shared bathrooms and kitchen, but it would be harder to be approved if each home has its own kitchen and bathroom.
g. We will have to talk to the water masters first, then the county planners (planners don't actually know much about water and stuff, so we have to get all of our ducks in a line before we talk to them so it's easier for them to come to a YES conclusion). DOE will give us a letter of approval, which we can then take to the planners. Chris says we have "willing landowners, and a valid use of water. The county has a very shallow bench of understanding of zoning due to turnover. Helping them helps you."
h. Irrigation water right on the right bank property. Housing during the irrigation season (april-october) would be a "slam dunk", but year round would be a different story.
i. Power: both properties are connected to the grid, so there is no need for a PUD capacity fee.

3. **Are there any building permit limitations that arise from the state easement with the Methow Salmon Recovery? For example, could we use the barn or other structures on the land to be retrofitted to meet our recommended goals? Does the easement allow for a mobile home or temporary home structure to be built on site?**
    a. The state owns the easement, the Methow Salmon Recovery Foundation owns the land through a simple title.
    b. There are different types of easements: conservancy easements are hard to deal with and very rigid, each easement has different ramifications on the land. Sugar property has a flexible easement.
    c. Solid steel frame in the yellow barn that could be retrofitted. Sugar property has a house that could be remodeled.
    d. To retrofit the yellow barn, we would need to develop an MOA between WWU program and the Methow Salmon Recovery Foundation, including what happens

if you succeed and if you do not succeed with your project. This protects from any misunderstandings and acknowledges that we all have the best interest in mind.

4. **Does the County allow composting toilets or require septic systems?**
    a. Both properties have legal septic - each structure on the respective properties are the structures for which the septic was permitted. We would need to do the math and find out how many uses, and what the county says about that
    b. The support structure helps with septic being allowed for our project
    c. We would need to do an expenditure test, which is worth the couple of hundred dollars to see if septic would work. Septic is under the jurisdiction of Okanogan county health district (director of health makes this decision).
    d. After Chris's chats with the counties around composting toilets, he has found that the county is hostile because they don't think people will use them right. If we make the application to the board and say we're good people, it might work.
    e. Holding tanks have been approved.
    f. Chris says the "easy pass would be something other than composting toilets."
5. **Do you have any documentation of the site before and after restoration?**
    a. Chris will dig for pre-restoration photos of the yellow barn property, and get back to us or Joshua.
6. **What kind of land stewardship would you like to see?**
    a. Chris said "I don't need to charge rents as long as I am getting something of tangible value out of this in terms of stewardship...it's really a no brainer."
    b. Chris also said "there are lots of areas that would respond really well to student-led projects and restoration, monitoring, and evaluation of what works well or not." Partners could help with stewardship/research/monitoring, which would make restoration happen more quickly, efficiently, and consistently.
7. **What is the timeline for the permitting process for zoning?**
    a. We could probably get it done before the start of the next field season, which is april 1st. A CUP requires state environmental policy action, and usually is a 120 day process. A CEPA is a 90 day process. In total, the permitting process could take around 3-4 months.
8. **Any caution that you would like us to go forward with as to not get ahead of ourselves where we inquire?**
    a. When talking to people, we can identify the project in or out of the city. We should identify organizations rather than properties, and contact people but no phones or addresses because that usually comes back to bite you in the butt.

Interview with Madelyn Hamilton, Local Tiny House Owner

Date: 28 July 2021

Notes from tour/interview:

- Madelyn got her trailer from a colorado company called trailer made trailers
    - Its a trailer specifically made for tiny houses (triple axel)
- Her tiny home is 8x28 just under legal limits, so she didnt need a special moving permit
- Her timeline: started june 2021, wants to be moved in by winter 2021
- 8.5 legal width, 13ft legal height
- Permitting:
    - Under 200 sq. ft does need a building permit
    - Have to be lived in permanently
        - 90 day dry cabin- a structure that ppl stay in 90 days or less- no plumbing or water. Does not need permit
    - Mobile home diff rules
- Composting toilets
    - Homemade?
        - Bucket, hole in the ground, treated independently, etc.
    - Nature's head- boat approved composting toilet. Madelyn's will be inside.
    - plumbing/electrical are all booked out
    - Manufactured composting toilets are automatically approved, building one would have to get a permit
- Septic
    - Connecting to another septic is hard, but buying your own septic is like $75,000
    - Question for our recommendations: who has the power in this situation, and how could the rules be changed in order for septic to be more accessible?
- AC
    - Madelyn has 2x6 windows
    - AC
    - can be expensive, and drain solar energy
- Heritage Barn- sheds for rent on the side of the road- people build them out. They move it for you.
- Methow Recycles
    - Mike Milikan
- Prefab vs. kit
    - Cost depends
    - No option will check all of our boxes

Follow-up Interview with Chris Johnson, Executive Director at MSRF

Date: 18 August 2021

Questions for Chris:

1. **Who is the DOH water master that you mentioned previously?**
   - Dept. of Health regulates water systems. Needing to set up a transient water system for encampment. Okanogan county health district or health department handles smaller transient water systems. Something larger (municipal) requires the state
   - Dept of ecology- use of irrigation water (water master)
   - What we would be using water for and when we would use it
   - A number of dry structures supported by one wet
     - Exempt use (ecology) or transient (DOH)
     - Average or total max number of population and daily total max water use in gallons/day
     - Watershed plan for methow basin assumes house goes through around 700 gallons/day
     - Field camp with x ppl- DOH has planning for group B transient planning to find showers/sinks/etc
       - State dept of health website or even county website
2. **What does the DOH need?**
   - Where do things go when they go down the drain
   - Twisp left- residential design septic for 3bd manufactured home would be suitable?
   - Listed by parcel number- file on what that septic system is. Find out if it would work or if we would have to modify it
3. **What are the plans for cleaning/clearing out the road area?**
   - Road that leads to the site through neighboring properties is a primitive road that is not maintained by the county
   - Talk to each of the neighbors to see what makes them happy
   - Wouldn't take a lot of work especially if we were to construct onsite
   - If we bring a bunch of stuff in and trash it, we are under an obligation to keep neighbors happy
4. **What would the land stewardship look like for students/interns?**
   - These are the areas that we see need room for improvement
   - For example, infestations, how functional is the riparian buffer, how many invasive weeds
   - What would change that, how to implement it, and manage it
   - Canary grass is amazingly invasive. MSRF has been trying to shade and crowd it out. A stewardship project could monitor if this is working
   - Things that last longer than one field season

- What does parking do to the site? How do we design that so we are not making the land worse?
- Lot of work with methow beaver project
- Post assisted log structures (human created beaver dam analogs) help create more complex habitat. Creates velcro on the landscape. Creates a lot of micro habitat for fish
    - Someone who implemented it could walk the stie with students and say what they are happy with and what they want to change
    - Hans or jared, or brain or john

5. **Do you have more details on the restoration project and ongoing restoration?**

- Designs for when they created the side channel on the side of the property.
- First project: (chris hoag) training workshop with 30 practitioners created a setback channel. Section of the river was migrating and experiencing bank failure dumping sediment on spawning gravels. Treatment that required little money- cheap and cheerful (search on google). What can you do to nudge a system back into the direction you want to be going (also called stage zero)
- Also dug up cars, burned houses, and removed garbage
- Full drawing set on re-meandering the stream. PDF much appreciated

6. **Are there any additional permits needed due to the mobility aspect of the project?**

- The development moratorium would prohibit a house on foundation
- Seasonal field camp to support restoration of_____is different (not year round worker housing- creates enemies and supporters)
    - No box for this
    - Conditional use permit- have to be approved as long as we meet the conditions

7. **Do you see a loose timeline that all these events should follow?**

- Already ran by idea into the county. Planning director is supposed to talk later this week. Concurs with CUP as a logical approach
- First step- after we come up with mission, we sit down with the director at county planning and go for a non ambiguous road map where we ask them to vest the process that we would jump through to get approval
    - What we say: This is what we want to do, how we think we will go through from point a to point b, what do you think we need?
- Make roadmap with minutes from county
- They will tell us to talk to health department, building, etc
- Always make sure we go back to the county
- Want project to be as clear and conclusive as we wanted
- Chris would be happy to participate throughout the process and help that happen

8. **In our previous interview with you, you had mentioned getting the trailers tagged. Could you elaborate on more specifically what this means?**
   - Response to RV lobbyists that mobile homes and prefabs all have to go through a licensing process. Creates an unlevel playing field for do-good groups.
   - If a community wants to approve a compound of tiny houses, they have to be actually approvable by the city or have a tag approved by labor and industries
     - If building own, can go through the state
   - Kits will come with a tag
   - Focus is not on a housing community- hard shell grade up of fire camp. Be careful with the county trying to call us on permanent structures. If we start growing roots, we are straying into a different permitting world. Something we need to think about in terms of crossing the line.
9. **Since part of the Twisp ponds land is available for annexation, how does that change the process of building and permitting?**
   - Completely diff government entity
   - If we annexed right ponds into twisp they would incorporate water right into system and issue a water right meter
   - It might make permitting easier
   - Annexation can be difficult
   - Kurt Dannison winthrop town planner- tell him about the project and ask him what is would be like to work with the town, if they want us to in any way, etc
   - Simplifies some aspects of the project but adds the annexation process. Not that big of a deterrent so it would make sense
   - Moratorium doesn't apply in the town
10. **What would we want the letter to the state regarding the state easement to include?**
   - Mark Duboisky-Recreation conservation office in olympia. Coordinator of all of the salmon recovery entities
   - Deed of right for twisp ponds- won't develop for full time residential, commercial extractive, r industrial uses that would be inconsistent with environmental restoration
     - Our project involves environmental restoration
     - Make the case that its consistent with the restrictions on the land
   - Okanogan tax sifter and parcel number. Contact the auditor's office and ask for a copy to be emailed. Ask for Kristina
11. **How extensive should building retrofits be?**
   - Kind Of comes off as putting down roots?
   - We are repurposing the existing use, which will have its own permitting process

- Barn serves a purpose year round- staging, storage, etc. We're gonna modify that to support a seasonal use by interns by improving cooking facilities and sanitation facilities. Were gonna use this much water, etc