

**Natural Resource and Community Issue – Final
Lake Whatcom Water Quality**

**SOC 790 Community and Natural Resource Development
Instructor: Meredith Redlin**

**Prepared by: Jim Schneider
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Introduction

Lake Whatcom serves approximately 85,700 residents in and around the city of Bellingham Washington with the only supply of fresh potable water (Pizzillio, December 2001). In addition to providing water this lake is an ideal place for people to build homes, golf courses, and enjoy water activities such as boating, fishing, and swimming. In the past ten years there has been growing concern among citizens and the local government over increasing levels of pollutants detected in the lake.

This study will first identify pollutants and the context in which human activities have led to the current condition of the lake. Next a policy that leads to the establishment of a coalition of stakeholders that work together to restore and protect the lake will be proposed. The development of this policy will require, identifying stakeholders, examining a strategy to promote salience in the community, and using a learning approach model to implement change. An alternative assessment will be presented as a tool that partnerships formed during the learning approach can use to negotiate change.

Context of Impacts

Pollutants Detected

The pollutants detected include nitrates, phosphorous, benzene, and fecal coliform (Cuimano, 2002). Phosphorous is a nutrient that in excessive amounts can cause an explosion in aquatic plant populations. This condition eventually creates an anaerobic (low oxygen) environment, which can be deadly for aquatic life and can affect the taste and color of drinking water (Cuimano, 2002). In addition to creating algae “blooms”

excessive nitrate exposure can effect the conversion of nitrate to nitrite by the body, which can interfere with the oxygen-carrying capacity of blood. This condition can cause serious illness and sometimes death. Infants are especially sensitive to high nitrate levels (EPA, 2005). Short term exposure to benzene can cause temporary nervous system disorders, immune system depression, and anemia. Long term exposure can lead to chromosome aberrations and cancer (EPA, 2005). Finally ingestion of fecal coliform can cause short term effects such as diarrhea, cramps, nausea, headaches or other symptoms (EPA, 2005).

Primary Causes

The primary factor for the presence of nitrogen and phosphorous is the over application of fertilizers on lawns in residential areas and a nearby golf course (Pizzillio, December 2001). Benzene detections can be attributed to various water craft used in the lake, especially those with two cycle engines (Pizzillio, April 2001). A faulty sewer system has been linked to the presence of fecal coliform (Pizzillio, 2002).

Secondary Causes

An important secondary factor is the zoning and development of residential properties and a golf course near the lake. With an increase in demand for new home construction the area is currently being developed at a rapid rate. In addition the preferred landscaping choices are the traditional savannah lawns that require large areas of green, well manicured grass.

The growing stresses on the infrastructure from an increase in population around the lake have caused problems with the operation of the sewer system. The occasional failure of the system has resulted in the release of fecal coliform in the lake (Pizzillio,

2002).

Lake Whatcom is a popular recreation destination and attracts many people who prefer swimming and skiing in calmer freshwater to the sometimes unpredictable bay water. This includes using gasoline powered watercraft that spill or discharge benzene in the lake. Watercraft with 2-cycle engines have been targeted as a primary source responsible for benzene detections in the lake (Pizzillio, April 2001).

Change Policy

Now that the primary and secondary causes of the pollution in Lake Whatcom have been identified it is now necessary to create a policy in which these damaging behaviors are changed. The strategy is to develop a coalition of stakeholders that will work together to restore and protect the lake. The development of this policy will require identifying stakeholders, examining a strategy to promote salience in the community, and using a learning approach model to implement change.

Identifying Stakeholders

Stakeholders are individuals or groups that have an interest in a common resource. These stakeholders can be classified into two groups. The first group called “nuclear” stakeholders are directly linked to resource use and planning. The second group called “satellite” stakeholders do not directly control resource policy but can apply outside pressure that leads nuclear stakeholders to create change.

Once the stakeholders have been identified an analysis can be made to whether they possess trait-taking characteristics. Trait-taking stakeholders already exhibit characteristics that can be used to help create change in resource use and protection.

Nuclear Stakeholders

The following is a list of identified nuclear stakeholders:

- Citizens and businesses in Whatcom County who receive their municipal water supply from Lake Whatcom.
- Residents who live within the Lake Whatcom watershed.
- Real Estate brokers and developers who operate in the Lake Whatcom watershed.
- State and local agencies responsible for regulating water quality.
- Local municipality that treats and distributes water for residential and industrial use.
- Citizens that can vote in local elections.

The common link among the nuclear stakeholders listed above is that they all control resources that can lead to change.

Satellite Stakeholders

The following is a list of identified satellite stakeholders:

- Local non governmental organizations (NGO) i.e. People for Lake Whatcom.
- Local Environmental Studies College – Huxely College of the Environment
- Tourists that recreate in or around Lake Whatcom.
- Businesses that benefit from tourism.
- Aquatic life within the lake.

While NGOs may not have the direct power to control policy they can certainly affect salience of the issue. An NGO has the ability to create public awareness regarding an issue and create outside pressures for behavior change. While aquatic life cannot speak for itself an NGO which appreciates it for ideological and philosophical reasons would be

willing to fight for protections. Huxley College of the Environment (a local college specializing in environmental studies) may view the lake as an opportunity for intellectual exploration. Decreased tourism could directly impact businesses (rental equipment, hotels, and restaurants) that may push for changes in resource use and protection.

Trait-Taking Stakeholders

Trait-taking attempts to create change by utilizing resources or traits that are already present. As mentioned above the resources of an NGO and Huxley College could affect the outcome of resource use policy. One of these methods would be to create a high degree of salience within the community.

Salience

Now that the stakeholders have been identified salience could be used to create the demand for change in resource use in Lake Whatcom and its watershed. Salience is the condition in which resource protection has reached a critical point and direct action must be taken in order to preserve it. Because drinking water is a vital resource to a community this issue would lend itself to a high degree of salience.

Salience could be created by stakeholders that want to protect the resources of Lake Whatcom. An example of creating salience would be to promote a recently conducted study by Huxley College of the Environment (Matthews, 2004). The finding of the study concluded the following:

- The amounts and doses of chemicals used to treat drinking water have increased with time.

- Algae that can cause drinking water taste and odor problems have increased with time.

This information could be provided to the community by a local NGO that already has the organizational capability. This would create the salience required for the community to begin demanding a change in resource use policy. In the face of scientific evidence even real estate developers and property owners would have to recognize their behaviors are impacting the only potable water source for 85,700 people.

Feeling backed into a corner, real estate development stakeholders may be tempted to recruit a “front group” to champion their cause. Front groups generally incorporate “green” sounding names only to support a pro-business agenda. This would certainly create an atmosphere of confrontation and would lead to long term conflicts of resource use. This may lead the local government to try a “command and control” approach to resource use and protection. This approach of legislating rules and enforcing them creates conflict among stakeholders and creates a bureaucracy that is often under funded and slow to react to change.

However instead of wasting energy in confrontation between environmental, business, and community groups, a coalition that attempts to work together to solve resource use and protection issues could be formed. By participating in a community based learning approach these stakeholders can help restore and ensure the sustainability of natural, human, social, and fiscal capital of Lake Whatcom.

Community Based Model

Now that salience has been used to bring stakeholders together a community model can be implemented. The following discussion identifies the resource capital of Lake Whatcom and how a learning approach can be used to form stakeholder partnerships to ensure resource protection.

Capital Resources

The natural resource of Lake Whatcom extends beyond just a body of surface water, but the base of an entire ecosystem. Lake Whatcom provides habitat for wildlife including 13 species of native and non native fish, 125 species of birds, 2 species of reptiles, 10 species amphibians, and 49 species of mammals (Lake Whatcom Cooperative Management, 2005). In addition the watershed area of Lake Whatcom provides habitat for an unknown number of macro invertebrates. The watershed is also home to several species of forest plants including old growth hardwood trees, understory plants, and riparian plants in the limited wetland areas.

The human capital of Lake Whatcom includes 4,737 homes and 13,000 people. The lake is the primary source of drinking water for the entire city of Bellingham, Washington and 50% of Whatcom County (North Cascades Audubon Society, May 2002).

As a hub of cultural activity Lake Whatcom provides aquatic recreational opportunities such as fishing, swimming, and boating. The watershed area is a popular destination for golfing, hiking, biking, and horseback riding. These activities provide the necessary mental and physical fitness for residents and visitors of Whatcom County. In addition several parks with playgrounds, picnic tables, and shelters surround the lake.

These areas are important for social interaction among families, religious and social groups, and businesses.

While it may be difficult to quantify the fiscal capital of Lake Whatcom the impact to the local economy is easy to identify. Lake Whatcom is in close proximity to the highest population center of Whatcom County. Therefore water pumped and treated from the lake can be conveniently distributed to residents. Because Lake Whatcom is a surface water source extraction costs are lower compared to municipal systems that rely on groundwater. In addition the lake provides a plentiful source of water allowing for future expansion of industrial and residential use.

Businesses that focus on outdoor recreation benefit from the presence of Lake Whatcom for rental and sales of recreational equipment. In addition a golf course in the watershed provides seasonal and year round employment. Local restaurants, retail stores, and hotels and motels also benefit from visitors to Lake Whatcom.

Real Estate developers have been benefiting from building single homes and developments within the Lake Whatcom watershed. With an expanding population and a real estate boom due to low interest loans profits for real estate developers have increased dramatically.

Learning Approach to Resource Protection

The learning approach (Lightfoot et al, 2001) will require the coalition of resource stakeholders to understand the current conditions of the lake, create a vision for the future use of Lake Whatcom, plan for this vision, form partnerships among the stakeholders, take action for resource protection, and reflect on the positive and negative results of this action.

Environmental Assessment

Before visions of the future can be made the current condition of the lake's capital resources must be examined. This would require the coalition to conduct (or fund) a baseline assessment of the capital resources of the lake. The results of this assessment would be used to gauge progress and to guide decision making during the learning process.

This assessment would include a quantitative evaluation of capital resources such as pollution levels in the lake, habitat surveys, the number of recreational visitors, economic impacts, demographic information of residents, and other additional information about resources. In addition this assessment would also consider qualitative information such as citizen's attitudes towards resource use, quality of life, and resource regulation.

Visioning

The visioning process would allow stakeholders to share their hopes for the future use of Lake Whatcom. It would be expected that these visions would vary considerably among stakeholders. Community members may see the lake as a hub of recreation, while local environmental groups would likely prefer more wildlife habitat to be created around the lake. Property developers would likely see the potential for creating high end homes in a desirable location. Local government may provide a vision of the lake as a continued resource for drinking water. They may also share a vision of a resource that can no longer be used because of pollution.

One tool to help share in the visioning process would be to have each stakeholder create a map of what they think Lake Whatcom and its watershed should look like in 10,

30, and 50 years. Elements from each of these maps could be incorporated into the next learning phase.

Planning

After each member has shared their vision for Lake Whatcom a plan can be developed that incorporates these ideas. Elements from each of the stakeholders maps could be included to create a central map. This map would help in developing a plan that would determine how the lake and its watershed should be used. This plan would determine where buffer zones should be built, how much land should be left for habitat, where future trails may go, and other visions outlined by stakeholders. During the planning process the results of the environmental assessment should be used as a guide.

Negotiating

During the planning process coalition members may experience conflicts in proposals to the central plan. In order for the learning process to be successful stakeholders must negotiate implementation strategies. A local environmental group may propose expanding habitat in the same area where property developers want to build condominiums. This is where the other coalition members may be able to act as arbitrators in this disagreement. A third coalition member may suggest a land swap where the developers agree to donate property located elsewhere in Whatcom County to a land trust in order to develop in the watershed.

To successfully implement resource protection strategies, partnerships among coalition members should be formed during the negotiation process. For drinking water protection a local environmental group may partner with the local government and

university in order to conduct an alternative assessment. Below is example of a few potential partnerships.

Resource	Resource Protection Strategy	Partners to Implement Strategy
Drinking water	Public education, constructing buffer zones along lake shore, promoting environmentally friendly fertilizers, lake monitoring. Conduct alternative assessment	Local environmental groups, state and local environmental agencies, public utility
Wildlife Habitat	Ensuring habitat restoration and protection.	Local government, local environmental groups,
Parks and Recreation	Ensuring public has access to Lake, keeping lake clean form recreational activities, making sure lake is safe to use.	Local government, local environmental groups, recreational clubs, local businesses
Economic Development	Ensuring buildings are environmentally friendly, promoting recreational activities and tourism at the lake.	Property developers, local university planning departments, local architects, local businesses

Action

Before action can be taken it would be necessary for the coalition to present the final plan in a public meeting. This would allow full participation and may provide valuable feedback to the coalition. Depending on the reaction of the general public the coalition may need to continue planning and negotiating or they may proceed to taking action.

After public comments have been incorporated into the final plan the partnerships then can actively implant education, design, and monitoring programs. If some unforeseen circumstances arise during the implementation process then the partnerships may need to return to the coalition for additional planning and negotiations.

Reflection

Once actions have been taken it is important to evaluate their success or failure so that adjustment can be made. Goals should be outlined for each action and then over time compared to the baseline assessment conducted at the beginning of the learning process.

An example of monitoring quantitative progress would be to compare phosphorous levels over time to the baseline assessment. If the levels remain high then the plan may need to be adjusted to create more buffer zones and increase education for non phosphate fertilizers.

An example of monitoring qualitative progress would be to take a survey of visitors to the park for recreation. Questions in this survey could include: How do you feel about the quality of the park, Should there be more access, Are you concerned about water quality? This would provide important feedback on how the actions of the coalition are being received by the community and if more education or changes to resource use are required. Whatever the results monitoring progress over time is the key to making the correct adjustments for the long term sustainability of Lake Whatcom.

As mentioned previously a partnership could be formed during the learning process to conduct an alternative assessment. An alternative assessment proposes changing behaviors, resource use, and implementing alternative technologies. This is a different approach to a risk assessment. Risk assessments generally involve the creation of mathematical formulas that are not well understood by the public that can easily be manipulated and create uncertain levels of safety. The results of the alternative

assessment could be used by coalition members to help develop plans and negotiate how resources are used.

Alternative Assessment

As discussed previously Lake Whatcom has been impacted by four separate contaminants. Two of these (phosphorous and nitrate) are the result of fertilizer use in residential yards and a golf course near the lake. Benzene is the result of the use of motorized vehicles in the lake. Fecal coliform is present due to rapid development demands on an undersized and outdated sewer system.

Alternatives to Reduce Phosphates and Nitrates

Alternatives to fertilizer use range from no further use, using alternatives such as: non phosphate fertilizers, manure, and compost, or no action (continued use of fertilizer). To ensure that no further impacts occur to the lake a ban on all fertilizers could be enacted. This approach would be the simplest and most effective action. However banning all fertilizers would certainly cause friction between private landowners and the local government. Less effective and intrusive alternatives could be implemented. One alternative is the use of non phosphate fertilizers or more "organic" solutions such as manure and compost. This compromise may resolve a conflict of interest, but is no guarantee for better water quality. Over application may still cause low oxygen levels in the lake. Unfortunately manure (nitrates and bacteria) may cause problems of its own if not properly managed. Continued use of fertilizer would only exacerbate the problem of low oxygen levels in the lake.

The best alternatives would be to implement a ban on phosphate containing fertilizers. Non phosphate containing fertilizers would still be allowed unless oxygen

levels remain below normal background levels. If the levels continue to be below normal a total ban on all fertilizers would need to be enacted.

Alternatives to Reduce Benzene

The alternatives for benzene impacts caused by watercraft include: Banning all motorized vehicles from the lake, banning two cycle motorized vehicles from the lake, or taking no action and allowing all watercraft on the lake.

In addition the presence of benzene in surface water may be linked to runoff from highways. This has not been proven at Lake Whatcom and would require a surface water assessment to link the impacts. However if a link is found the alternatives would be to ban additional road construction in the lake watershed, limiting the location and distance of construction, installing a storm water runoff collection and treatment system between the roads and the lake, or allowing unlimited construction near the lake.

Banning all motorized boats would create a significant economic impact on recreational based businesses. Banning the worst polluters (two cycle engines) would still allow people to enjoy motor sports on the water while significantly reducing impacts. In addition restrictions on water craft may induce industry to develop low or zero emission motors.

While banning new construction is the simplest and most effective way to prevent additional impacts caused by storm water runoff this action would increase the conflict between developers and the local government. Additional controls such as treating storm water runoff by using an oil water separator could help reduce impacts. However, this would require expensive equipment that needs constant maintenance and monitoring. In addition such a treatment system is generally large and not aesthetically

pleasing for a residentially developed area. Finally allowing the unlimited construction of roads near the lake could only be advanced by results from a surface water assessment that proves that a link does not exist between run off from the roads and the presence of benzene in the lake.

The best alternative for reducing benzene would be to ban two cycle engine watercraft on the lake. All other watercraft would be allowed unless a reduction of benzene does not occur. A ban on new road construction should be put in place until an assessment that shows no impact to surface water is conducted. If a link is shown new construction will require storm water treatment options.

Alternatives to Reduce Fecal Coliform

The alternatives to the repairing of the sewer system to reduce the presence of fecal coliform would range from: Constructing a large capacity system to meet the needs for future development, building a system that meets the current needs, or not replacing the sewer system at all.

Constructing the sewer system for anticipated demand may help save money in the future. However, this policy may result in encouraging new construction, which led to the stresses on the current sewer system. Building to meet the current needs would cost less and discourage construction, but may cost more eventually if new developments are built. Not repairing the system would certainly result in the continued release of fecal coliform into the lake. While this is the cheapest option it is has the potential to severally impact public health and increase the cost of treating water for drinking.

The best alternative to reduce fecal coliform levels in the lake and save money in the treatment of drinking water would be to repair and upgrade the sanitary sewer

system. The sewer system should be constructed for moderate growth so that it could maintain current demand with room for sustainable future development. The system should not be built for large capacity. This would only further the push for unrestricted development. If the system requires increased capacity in the future than the costs would need to be paid by the property developers.

Alternative Assessment Selection

The alternatives were selected because:

- They require a reduction in the use or release of identified contaminants.

Ultimately the most important goal is to reduce contamination in Lake Whatcom.

- They offer alternatives that can be easily adapted. Changing the product people use to fertilize would be easy to implement. Two cycle motors are outdated and most are being replaced by four cycle engines.
- With the exception of building an oil water separator (if required) the alternatives presented are cost effective. The construction of a new sewer line will actually save money in water treatment costs.

The alternatives do not economically impact ordinary citizens. Limited development would only affect property developers who would not lose money, but would be limited on opportunities to make more money. Property owners may benefit from these restrictions with increased property values.

Summary and Conclusion

The purpose of this study was to create a policy in which stakeholders worked together to restore and protect the resources of Lake Whatcom. First the pollutants impacting Lake Whatcom were identified. Next the context in which

activities that led to the pollution of lake was discussed. Salience created by using scientific research and action by trait taking stake holders led to the community's demand for action. This led to the establishment of a coalition of stakeholders that works together to restore and protect the lake's capital resources. The first step for the coalition was to assess the current conditions of the lake. This assessment would then be used as a baseline to monitor the status of the lake's capital resources. Once the assessment was complete the coalition could begin a learning process in which visions were shared, plans made, partnerships formed, and conflicts resolved. Once a plan had been completed and comments from the general public were received, the partnerships could then begin actively educating, designing, and monitoring resource protection. The results of the monitoring process would be used as a guide to make adjustments to the plans of resource use and protection. Additionally one tool that partnerships could use to negotiate change is an alternative assessment. An alternative assessment helps the negotiating process by replacing the confusion and ambiguous nature of a risk assessment. By creating an environment of cooperation stakeholders can spend less energy in conflict and more time working together to protect Lake Whatcom.

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