Kamchatka

Watershed management

Project

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Narrow River Watershed / Awesome Education
Developed as a segue for ninth grade Earth Science Students going into tenth grade Biological Science classes
Time frame: five 90min classes plus one evaluation
Class size: 25 – 28 students
Heterogeneous, fully differentiated classes

Subjects covered in the activity: **THE KAMCHATKA PENINSULA**

1) **the concept of whole watershed management**
2) **defining a watershed**
3) **benefits to humans + ecology of whole watershed management**
4) **problems of the Kamchatka**
5) **mapping a watershed**
6) **careers in watershed management**

SKILLS:
1) INTERNET SEARCH AND EVALUATION OF INFORMATION
2) SMALL GROUP INTERACTION in LABS + ACTIVITIES
3)DRAWING AND INTERPRETING MAPS
4) FORMIING + PRESENTING CONCLUSIONS

Primary Standards met: S2a, S3a, S3d, S4a, S5b, S6d, M2c,

CONTENTS:

PAGES

KAMCHATKA WATERSHED PROJECT

Unit Overview:

Part один (part one):
is an introduction, to the real life story of a 1,000 mile long peninsula in Far East Russia called the Kamchatka Peninsula. It begins with a story, written by a Rhode Islander for Field and Stream Magazine, and then moves to internet based research into what this area of the world is like, what creatures live there now, and the people who are involved with it.

With a guided tour of The Wild Salmon Center's web site (http://www.wildsalmoncenter.org/) students will find out why many people believe that the Kamchatka Peninsula is such a valuable place and why it is being managed today, in a new and unique way. Students may see how the philosophy of keeping entire watersheds free from the effects of modern human encroachments, may "safeguard the livelihoods of communities that rely heavily on the economic benefits and food security provided by healthy Kamchatka salmon runs."

Students will do additional research into the things that are threatening the Kamchatka, as well as subscribe to the Wild Salmon Center's newsletter to help with journal entries on current events in the area of the peninsula.

Part два (part two): activities and labs (skills + uses of the skills)(+ their order)

Activities:

1) Identifying a watershed
2) drawing a watershed
3) reading topo maps

Lab One: Drawing topo maps

Activities:

3) Finding point source pollutions (ID in room, on tables, then on maps)
4) kinds of point source pollutants (Brain storming, around home work)
5) the problem with gene escape (+ the definition of pollution)

Lab Two: Effects of Pollution

Activities:

6) building the foundation of a watershed (clay modeling)
7) effects of weathering + glaciers (added to Act 6)
8) the upper layers (forming the soils + lay of the land, added to act 7)

9) where does the water come from? (and where did it go, added to act. 8)

Lab three: playing Kamchatka (largely student created game based on characters and situations provided to them)(who gets to use Kamchatka?)
Lab four: problems keeping watersheds viable.
a) special solution of 'whole watershed' based conservation.

Part три (part three):
Students will conduct research and prepare digital presentations on a career in the Kamchatka Peninsula. In the process students will complete an actual job application from the WSC's web site.

Part четверка (Part Four): evaluation
With teams of students redistributed (differentiated by interest or job from lab three), each group needs to present their best plan for the Kamchatka area, based on information from labs, activities and the Kamchatka game (competing watersheds???)

Без перевода (Part Five): The culminating event:
Guest speaker; How does Kamchatka's story affect or apply to other watersheds of the world (with discussion afterwards.)

Part **один** (part one):

Researching the Kamchatka

A) Begin part one by reading the story " Endless Salmon" C.J. Chivers, Field and Stream Magazine, April 2007, pgs 76-79.

Alternate introductory story: higher reading level, lower fishing interest,

In Russia's east, a bid to save the salmon

By C.J. Chivers The New York Times

Published: October 13, 2006

UTKHOLOK RIVER BIOLOGICAL STATION, Russia The wild salmon still rush the dark Utkholok and other rivers on Kamchatka, one of the last salmon strongholds on earth. They surge in spring and pulse in for months, often side by side in run after run.

All six native species of Pacific salmon remain abundant on this eastern Russian peninsula, scientists say, appearing by the tens of millions to spawn in its free-running watersheds. Even in the chill of October they come: coho and a trickle of sockeye, mixed with sea-run trout and char.

Now, in a country with a dreary environmental record that is engaged in a rush to extract its resources, the peninsula's governments are at work on proposals that would designate seven sprawling tracts of wilderness as protected areas for salmon, a network of refuges for highly valuable fish that would be the first of its kind.

Encompassing nine entire rivers and 2.4 million hectares, or more than six million acres, the protected watersheds would exceed the scale of many renowned preserved areas in the United States. Together they would be more than twice the size of Yellowstone National Park in the United States.

These areas would be protected from most development, the government of Kamchatka says. Their purpose would be to produce wild salmon - for food, profit, recreation and scientific study, and as a genetic reserve of one of the world's most commercially and culturally important fish.

If approved, the plans would push Russia toward the center of international efforts to prevent the remaining wild Pacific salmon stocks from suffering the

declines and population crashes that have beset sturgeon, bluefin tuna and the Atlantic's salmon, halibut and cod.

"Having weighed everything from the perspective of the economy, I have convinced myself that we have to have a different future, and that salmon must be allowed to return to spawn," said Aleksandr Chistyakov, Kamchatka's first deputy governor, during an interview in Petropavlovsk-Kamchatsky, the region's capital.

Chistyakov said Kamchatka was selecting protection zones not to create wildlife reserves but because fish runs are the best foundation for the peninsula's economy. Oil, natural gas and mining sectors will be developed, he said, but will provide a comparably brief revenue stream. Sustainable fishing, he said, can last generations.

The government's position, set forth in documents in late August, has surprised even scientists and conservationists who have lobbied to protect habitat from the development pressures of post-Soviet Russia.

"This initiative is magnificent," said Dmitrij Pavlov, director of the A.N. Severtzov Institute of Ecology and Evolution at the Russian Academy of Sciences, during an interview at this biological station. "It is important not only for people who live today, for contemporary people, but for future generations."

Andrei Klimenko, a director at the Wild Salmon Center, an Oregon-based organization working internationally to conserve salmon runs, said the proposal could become a milestone in the management of a beleaguered resource. "It will be a precedent," he said. "There is nothing else like this anywhere else."

Each year, Russian and American scientists say, from a sixth to a quarter of the North Pacific's salmon originate from Kamchatka, a peninsula about the size of California.

Its endurance as an engine of sea life falls from geography and politics.

Until 15 years ago it was a closed Soviet military zone, untouched and almost without roads. Today it remains a remote region of volcanoes and glaciers, ringed by forested slopes and tundra laced with aquatic habitats where salmon spawn and their young grow.

Since Soviet authority evaporated, however, Kamchatka has faced intensifying pressures. Prospecting has begun, mines have been dug, roads have been cut and poaching - from subsistence harvests to industrial-scale egg-stripping of salmon for caviar - has become nearly unchecked. There are plans to develop oil and natural gas wells offshore.

A few of the peninsula's salmon rivers are already depleted; others are at risk.

"We face a choice," said Olga Chernyagina, president of the Kamchatka League of Independent Experts, a Russian conservation group. "Will there be salmon, or not?"

Estimates of the salmon fisheries' annual value range to $600 million, and Kamchatka's sea-run fish and their briny bright-red eggs are an important

source of protein and employment for Russia and other countries.

Chistyakov said that Kamchatka's wild state was its best asset and that the rivers slated for protection were among its richest in fish yield and diversity. Jack Stanford, an ecology professor at the University of Montana and adviser to the Wild Salmon Center, who with Moscow State University has helped direct research at biological stations on Kamchatka, agreed.

One river, the Kol, he said, has as many as five million returning salmon each year. "It has fish coming in from ice to ice," he said. "It's an amazing place."

A recent tour of two rivers selected for protection, and helicopter flights over five others, showed a verdant wilderness.

Undammed rivers fall from mountains and meander through tundra, creating networks of lakes and side- channels, dense plant communities and flood plains fertilized by decaying fish. Brown bears abound. Rare birds, including massive Steller's sea eagles, are a daily sight. At the Kol's mouth, where river meets surf, dozens of seals ambush passing fish.

But in places the banks are trampled by poachers and their camps. Treads from their all-terrain vehicles have cut scars in the tundra.

The efforts to create salmon refuges formally began in 2001 when Kamchatka's administration, which governs the southern part of the peninsula, signed a memorandum of understanding with the Wild Fishes and Biodiversity Foundation, a local conservation group, proposing the contiguous Kol and Kekhta basins as a protected zone. Later, the Koryak Autonomous Okrug, which governs the peninsula's northern section, accepted a proposal to protect the contiguous Utkholok and Kvachina basins.

"What makes this special is that these rivers are being protected while they are still amazing fish producers," Klimenko said.

"To preserve something that is not destroyed is much less expensive than restoring an ecosystem that is already broken."

B) Have students work in groups of two, differentiated by interest, according to the following subtopics:

Russian ecology history	Sea of Okhostsk
History of trout / salmon	Kuril-Kamchatka trench
Kamchatka geology	climate and weather of Kamchatka
Flora of Kamchatka	fauna of Kamchatka
Kamchatka earthquakes	fly-fishing in the Kamchatka
Villages of Kamchatka	pollution in the Kamchatka
Poaching in the Kamchatka	Russian military in Kamchatka

Each group will be responsible for the research of one of these topics and the presentation of information to the whole class. Allow for different presentation styles and suggest presentation formats before students begin collecting information. See data sheet one. Each group is to make a 3.5" X 5" flag (index card + shish-ko-bob stick) that represents their subtopic. One member of each reporting group should hold the flag during their presentation, and the flag should be planted on an appropriate location of a wall or large desk map of the kamchatka region as the presentation concludes. Each groups "data sheet one" should be displayed on a classroom wall for future reference by the students.

Part **два** (part two):

activities and labs

Activity one: Identifying a Watershed Separate students into groups of 2-3, according to the abilities of: following directions, manipulating materials and recording data / results. Give each group a waterproof marker, one square of tinfoil, two paper cups and a place, such as a shallow pan (needs to be two times or more larger in area than the foil) of sand, where interesting designs, shapes + contours may be found. Students will need a pointed pencil or pen to poke small holes in the bottom of one of their cups to make a sprinkler.

Directions:

a. Pick an "interesting" looking section of sand, place tin foil over this spot and carefully press the foil down into all of the contours of the sand.
b. Fill a cup (no holes) with water from the supply. Hold the second cup (the sprinkler) over the tinfoil, pour water from the supply into the sprinkler so that it 'rains' over the foil. Try to find the boundaries between where the water runs directly off the foil and where it tends to collect +/or pool or stream together before running off. Now try sprinkling a thin layer of sand over the foil and repeating the rain to see if this helps identify those boundaries mentioned above. Without moving the tinfoil, use your marker to draw a (squiggly) line around one of those areas where the rain seems to collect and run together. Lift the tinfoil off the sand, wash clean and flatten out, being careful to not smudge your marker line. Use the marker again to reconnect any portions of line that need mending or have opened up. Check to see that you have ALMOST completely encompassed an area. Use you marker to label the enclosed area "W.S."
c. Place a piece of paper over your tinfoil and trace what you have drawn onto the paper. (label this W.S. as well)

d. Be prepared to brainstorm with you class as to what the characteristics of that enclosed area are.

Activity Two: Drawing a watershed. Keep students in the same groups as in Activity 1. Make up a large batch of salt, water + wheat paste 'mud' ahead of time (each group will need one cup full.)

a. Carefully place the tinfoil back down onto the sand in as close to the same spot and way as possible. Use fingers to 'paint' a thin layer of the 'mud' from your class supply onto the tinfoil (face pointing up only.) wait for the mud to dry.

b. Locate the place on your foil, within the boundaries of W.S., that looks like it is the 'lowest.' Place the metric rule 90 degree right angle to the surface of your foil at this spot.

c. Add water (colored with blue food coloring may help here) until it reaches the 1cm mark. Use your marker to mark the level of the water everywhere inside your W.S. boundary.

d. Repeat step C for 2, 3, 4, 5, etc. centimeters

e. Carefully drain the water from your pan, disturbing the sand and foil as little as possible.

f. By eye, reproduce the contour lines that you have drawn onto the paper labeled W.S. that you made in activity one , step C.

g. Now, looking at your model watershed, imagine that the actual water table was normally at the 2cm line that you marked in step D above.

h. Label where you can imagine ponds, streams, wetlands, grasslands and forests might be able to live. Be creative!

i. Show your work to the class and tell what your reasons were for designing your watershed the way that you did.

Activity Three: Reading Topo Maps. Organize students into groups of two or three (new groups from Acts 1+2.) according to homogeneous educational level. Familiarize the class with the wall map of the Kamchatka Peninsula. Pass out copies of topo maps to each group and let them explore these maps for several minute.

a. begin a paper scavenger hunt for items on these maps such as volcanoes, rivers, hills , valleys and towns, etc.

b. next, request that each student find something on the map, that has not been mentioned out load in class yet. Have students work together within their groups to identify the latitude and longitude for each of these items. Inform the class that if someone else offers to the class the same item as they have chosen, that they will need up update and pick another place or feature on the map to offer to the class. Add that you have already predetermined the order that groups will go (but keep it secret from them!)
c. begin with an average group(s) and ask what the lat + long was for each of their items. Give the class a couple of min. each to try and determine what the item on the map is that they were referring to.
d. next repeat step C fro those groups that were expected to have the most difficulty with this assignment.
e. now review what the lines on their papers from activity two were. Do they see similar lines on these maps? What do they represent? What do they tell us about the shape of the surface of the land? Have students identify places of steep and flat gradients, high lands and low lands, etc.
f. review / model on the wall map, how to find locations and identify contours.

Lab One: Drawing a Topographical Map:

a. Keep groups the same as in activity three. The teacher should be the one this time to create the contours in the pan of sand that each group has.
b. Students do not need to touch or put anything onto the sand. After repeating activity 2 for this new "landscape," Students should use an 8.5" X 11" acetate sheet with a grid printed onto it (overhead projector sheet with ¼" graph paper grid copied to it.) Carefully place the grid over the sand (possibly supported by toothpicks from below or tape to the side of the pan if students are capable, if not, less bothering will best.)
c. Students should carefully look down from above at the pan (through the clear plastic) and using a metric rule or the grid, reproduce the 3D pan onto a 2D piece of graph paper, by eye.
d. What students have created so far in this lab, on the graph paper, is a contour map. To change this into a topographic map, use your imagination and knowledge to add the features of: streams, lakes, ponds, forests, wetlands and grasslands to your map. Do this by first

making a key w/ representative symbols and then adding these symbols to your map. Have both your key and map represent the numbers or areas of each mapped item.

Activity Four: Point Source Pollution.

1) First separate the students who reported on pollution in Part One of this unit.
2) Give these students the task of making two lists. One list should be of the types of pollution in the Kamchatka and the other list should be the places where these pollutions are found according to research (they may need to do more research to have adequately long enough lists of 7-10 pollutants. (the lists should be randomized in relation to each other.)
3) Arrange the remaining students into new groups, pairing those students with better mapping abilities with those who need more time to master this ability whenever possible.
4) The teacher should work with the class as a whole to differentiate between point and non-point source pollutions; having the students cross off any non-point pollutions from their lists, but labeling them as non-point source as well. Next work with the class to determine 'icons' that will be used on maps for the remaining point-source pollutants.
5) Have the students in charge of making the lists now work on preparing mini reports as to the potential harm caused by each of the remaining, point-source pollutants.
6) The other groups of students should now work topo maps of Kamchatka to create maps that show possible locations for each for each of the point-source pollutions.
7) Have groups offer justifications for their decisions, but shy away from saying that any group's maps are incorrect just because they may be different than the actual Kamchatka site.
8) Lead a Brain Storming session on the differences between point and non-point source pollutions.

9) Have students offer their research into the effects of the types of pollutions that were mapped (step 5.)
10) Allow / offer time for class discussion on pollution. Analogues to their own town, examples from experience etc. should all be investigated.

Activity Five: Pollution Fighting. Organize all kids into larger groups of four to five students each. Assign (and in rare classes let them decide on this) each student to one of the following tasks: REPORTER (responsible for notes and reporting back to class), CARTOGRAPHER (responsible for doing any mapping that the groups needs to do), ADMINISTRATOR (leads meeting of the group, makes decisions for the group), SCIENTIST (does research that the groups needs (computer based)), TOURIST (unobtrusively as possible, visits other groups and reports back what they are doing)

a. Assign or let groups pick one pollution at a time, from those in activity four. Students should stay in character as much as possible as they work on preparing 3-4 min presentations on the abatement of that pollutant.
b. See **pollution abatement form** for the format each group should use in a document to be handed out, read and commented on in a public forum (i.e. class wide)

Lab Two: Kamchatka the Games

Let students arrange themselves into groups of as close to four as practicable. Let them know that this part of the lesson will require collecting supplies at home and that groups members will be counting on each other.

- HOMEWORK ASSIGNMENT: (GIVE STUDENTS PLENTY OF TIME FOR THIS)(I.E. MAY BE ASSIGNED WELL AHEAD OF TIME) Each group needs to get one large, clean pizza box, each individual student needs to find an object approximately 1” X 1” X 1” that may be used as a board game piece (and donated to the class.)

a. Assign each group one of the following themes for their game:
    i. Gene escape
    ii. Weathering and glaciers
    iii. Kamchatka's volcanoes
    iv. A Salmon's Story
    v. Where the Water Comes From
    vi. Flora + Fauna of Kamchatka
    vii. Human and Kamchatcka Symbiosis

b. Give student groups adequate time to research facts about their subtopic.
c. Students may decide by group what the:
    i. Name of the game will be
    ii. Rules
    iii. Who will be responsible for creating what parts of the game
    iv. Any rewards for completing or winning the game

d. Give students time to construct game and debug it by playing the game themselves.

e. Make a rotation that groups may follow as they play each other's games. While playing, students will be individually responsible for filling in the **Kamchatka game facts sheet**.

Part три (part three): Digital presentations

a. Publish a list of the following jobs. Assist students with clarifying questions they may have about them, but don't trample on the research they will get later.
    i. Jobs / careers with the Wild Salmon Center
    ii. Jobs / careers as a Biologist
    iii. Jobs / careers as an ecologist
    iv. Jobs / careers conservationist
    v. Jobs / careers in the mining + nat. gas industries
    vi. Jobs / careers in eco tourism
    vii. Jobs / careers in wildlife management
    viii. Jobs / careers in wildlife law enforcement
    ix. Approved other topic

b. Allow students to work singly or in a group of two of their choosing. Assign one of these subtopics to each student and allow computer lab time to prepare either a MS slide show, MS Power Point Presentation, or Movie Maker movie.
c. *** teach / warn students about plagiarism and copyrights.
d. Assign length + content min + max amounts.
e. Each student should make a companion worksheet for their presentation, to be filled out by students during each presentation.
f. Have each student fill out a job application from the WSC's web site, print it out to be handed in to the teacher.
g. PRESENTATIONS!

Part четверка (part four): evaluation

With teams of students redistributed (differentiated by interest or job from lab three), each group needs to present their best plan for the Kamchatka area, based on information from labs, activities and the Kamchatka game.

a. groups start with a satellite image of the Kamchakta Peninsula at: http://www.terraserver.com/imagery/image_gx.asp?cpx=83.13129382&cpy=51.8508052&res=20000&provider_id=370&t=pan&OL=Off
b. students should look very carefully at this image and search for details that they may not have learned about so far in this unit. Of special interest should be the coastline, towns, roads and other signs of human or environmental impact.
c. groups should print the sat. image (one for each student) and identify a watershed by marking its' boarders with a black marker.
d. Next students should add rough estimates of contour lines to the defined watershed area on their images.
e. a key should be added to the bottom of the page and icons added to the map appropriately.
f. a five paragraph essay is now required of each student according to the following format:

introduction to watersheds, foreshadow themes + conclusion
theme one: the Kamchatka watershed and it's importance
theme two: positive aspects of the Kamchatka and it's management

theme three: negative impacts of humans on the Kamchatka Peninsula

Conclusion.

Без перевода (part five): **The culminating event**

Guest speaker on: How does Kamchatka's story affect or apply to other watersheds of the world. Presented by with discussion afterwards.

a. possible guest speakers include parent scientists, state biologists, and possibly a web chat session with the Wild Salmon Project or the author C.J. Chivers could be arranged.

BIBLIOGRAPHY

Endless Salmon“ C.J. Chivers, Field and Stream Magazine, April 2007, pgs 76-79.

In Russia’s East, A Bid to Save the Salmon, C.J. Chivers, New York Times, Oct. 13, 2006

http://www.wildsalmoncenter.org/programs/russia_far_east/

http://www.wildsalmoncenter.org/programs/kamchatka/

http://www.wildsalmoncenter.org/pubs/translated_lichatowich_intro.php

Sat. image #1
http://www.terraserver.com/imagery/image_gx.asp?cpx=83.13129382&cpy=51.8508052&res=20000&provider_id=370&t=pan&OL=Off

MATERIALS:

Part One: 1) Field and Stream article or included article. One copy for the reader.
2) plain 3.5" X 5" index cards + shish-ka-bob sticks. One each per group.
3) computers (on-line) one per group of two students.
4) "data sheet one." One per group.
5) large wall or table size map of the Kamchatka region. One per group. See:
http://www.avachabay.com/wallmap.htm

Part Two:

Activity 1) tin foil (one 12" X 12" square per group, paper cups (two per group), sand and large shallow pans (or a sand volleyball court that you can take your class to will be great), a source of water (large bucket or hose.) waterproof markers (one per group)

Activity 2) add salt + wheat paste 'mud' to activity 1 (one cupful for each group) waterproof metric rule (one per group) cup and water supply

Activity 3) same number of topo maps 1+2 (of the Kamchatka peninsula) as groups of students. Wall map of Kamchatka.

Lab One: same pans w/ sand as before, graph paper (2 sheets ea. Group) possibly tape and toothpicks, metric rule clear graph plastic (1 per group) colored pens / pencils could be used

Activity 4) computer access to the net (one computer) new maps of the Kamchatka Peninsula (topo map #2) board for Brain Storming

Activity 5) class computer access to the net. Maps from Activity 4. , Computer Abatement Form (one per group)

Lab Two: one large pizza box per group, one game piece per

	student, construction paper, paper glue, colored pens, pencils, crayons. Several examples of famous board games to show as examples.
Part Three:	computer lab, comp. video projector for presentation of digital media.
Part Four:	internet access, thick point black marker, fine point colored marker
Part Five:	Guest Speaker

Data Sheet One

Sub topic: _____

Student names: _____, _____

Representative (of your sub-topic) picture:

Picture reference: _____

Research:

Use MLA format for each.

Source #1 _____

Information:

_____
_____
_____
_____

Source #2 _____

Information:

_____
_____
_____
_____

Source #3 _____

Information:

_____
_____
_____
_____

Topo map #1


1652 g. Estrebokos
1223
g. Stol
sop. Bieriezovaya
1563
vlk. m. Siemliachik
vlk. Karymskaya Sopka
1468
(dis)
dom
1308 g. Kurgannaya
p. Kiedrovaya
o. Karymskoie
g. Bakiening
o. Vierkhnieavachinskoie
Kiedrovaya
Polovinka
48
1696
KHR. DZENDZUR
1262
1301 sop. Pirog
Dziendzur
1707 g. Jupanovskie Vostriaki
1510
Jupanova
49
Shielkovka
o. Shielkovskoie
shed
m. Jupanova
1798 g. Vierkhinskaya
70
vlk. Jupanovskaya Sopka
lag. Jupanovskaya
1674
pos. gieologov
g. Kupol
g. Nalygir 688
g. Niekhkur 1437
pier. Pinachievskii
p. b. Kalygir
ryb.
m. Kalygir
Nalychieva
741
shelter
bukh. m. Miedviejka
m. Sriedniy
bukh. b. Miedviejka
vlk. Koryakskaya Sopka
Razdolnyi
tourist base
shed
allotments
2741
vlk. Avachinskaya Sopka
2188
g. Kozielskaya
o. b. Miedviejka
barracks
86
fish farm
p. Morjovyi
Yelizovo
airport
307
935
g. Shiejkaya
bukh. Jieliezkaya
o. Krashieninnikova
Nalychievo
34
shed
shelter
Nagornyi
Novyi
Pionierskiy
Svietlyi
m. Nalychieva
poluostrav Shipunskii
Mokhovaya
(dis)
33
58
m. Barakty
shed
m. Shipunskiy
Petropavlovsk Kamchatskii
66
Dolinovka
Viliuchinsk
o. Toporkov
87
100
108

Topo map #2


Yelizovo
airport
allotments
tourist base
Razvolnyi
Mutnoy
Nagornyi
Pionierskiy
Novyi
Svietlyi
Mokhovaya
Avachinskaya Guba
Petropavlovsk Ka
Dolinovka
Chabalevka
Vilyuchinsk
o. Toporkov
m. Moyachkyi
m. Biezymiannyi
576
shed
farm
Not to Scale

Pollution Abatement Form

Name _____ **group #** _____

completed by (circle one): Reporter, Cartographer, Administrator, Scientist, Tourist

Primary job description: _____

Name or type of pollution: _____

Where is this pollutant from? _____

Is this pollutant still being added to the environment today? _____

Where in the Kamchatka is it? _____

What is the polluting effect? _____

_____

_____

What is being done to correct the problem? _____

_____

What are your ideas on what could or should be done about this pollutant?

_____

_____

_____

Kamchatka Games' Fact sheet group # ____

Names of Students _____, _____

_____, _____

_____, _____

Name of Game: _____

Game's Theme is: _____

Questions + Answers I encountered while playing this game:

_____, _____

_____, _____

_____, _____

_____, _____

_____, _____

_____, _____

_____, _____

_____, _____

_____, _____

My overall impressions of this game are: _____

_____