



# The Exchange

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## Living Lands – Forest and Town

The CLE is pleased to announce a new simulation created by Jen Andersen, Anne LaVigne, Conrad Stuntz, and Lees Stuntz, with support from the Austin Family Foundation.

### OVERVIEW

This lesson with multi-user simulation explores the management of a national forest and its surrounding towns. Student teams log in and make decisions for a local town or for the surrounding forest that has a large level of accumulated fuel. The decisions of individual teams impact all other teams. Damage from potentially catastrophic fires looms, and students must try to manage the situation to protect the area, both now and into the future. An [introduction video](#) describes this free simulation with information on how to get started with your students.

### Learning Goals

- Interpret data on line graphs.
- Identify how decisions impact individual teams and the larger system as a whole.
- Give justification for policies students believe will minimize



<http://www.clexchange.org/curriculum/simulations/livinglands.asp>

- negative human impacts on the health of the forest ecosystem.
- Create a plan for a fictional town or forest to improve economic viability while preserving the surrounding natural resources.

### Student Challenge

Create an economically prosperous town or forest while keeping the area environmentally sustainable over the next 50 “simulated” years.

### LESSON DETAILS

#### Preparation

1. Follow the instructions in the Technical Guide (pages 14-18) for creating a new account and adding teams to the simulation.
2. Divide students into teams of two to three students each. The maximum number of teams is nine (1 forest team and 8 town teams). The map (Figure 2) shows the forest and town names if all teams are played.

### QUICK GLANCE

**Age:** Middle/High School

#### Time:

- Introduction - 1+ hour
- Simulation – 2+ hours
- Basic Debrief – 1+ hour
- Assessment/Project – varies

#### Materials:

- One computer for every 2-3 students
- Simulation online at <http://www.clexchange.org/curriculum/simulations/livinglands.asp>
- Headphones
- Handouts (pages 10-13)
- Technical Guide (pages 14-18)
- Introduction/Debrief Slideshows and Notes (pages 19-33)

#### Key system dynamics concepts and insights:

- Cause and effect are not closely related in time or space.
- Action is often ineffective due to the application of low-leverage policies.
- Conflicts arise between short-term and long-term goals.
- High-leverage policies are difficult to apply correctly.

#### Curricular connections\*:

- NGSS - Human Impacts on the Environment
- Common Core ELA Standards

\* Read more on pages 8-9.

### THIS ISSUE AT A GLANCE

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The Fall is always a lovely time of year here in New England, heralding crisp days and fresh apples. This year we have had a magnificent summer full of bright sunny and not too hot days. The juxtaposition of the new school year starting as the season changes—the falling of the leaves, with the plants going to sleep—has always been an interesting contrast. However, for many of us, the summer time is also one of contrast, a time of both renewal and preparation for the influx of new students, with the excitement of a new year with new faces, and, hopefully, a new twist on curricular offerings.

In this newsletter, the CLE is debuting our first multi-user game, *Living Lands*. As you all have seen throughout the summer, it has been an extreme one for wildfires, with thousands of acres of land burned. The newest CLE curriculum brings the tools of system dynamics to bear in helping students look at such a complex problem in a way to start to make sense of it. They look at the interactions of the towns within a national forest and how their decisions might affect the extent and rates of wildfires.

We are also starting to rev up for our twelfth biennial Systems Thinking and Dynamics Modeling Conference, to be held June 25 to 27, 2016, in Wellesley, Massachusetts at Babson Executive Conference Center. An introductory workshop will be offered on June 24th, the day before the conference. We welcome input at all levels. What learning would you like to experience at the conference this year?

I hope everyone has a productive and enjoyable start to the year.

Take care,  
Lees  
(stuntzln@clexchange.org)

## UPDATES

### International System Dynamics Society Conference

This summer's ISDC in Cambridge MA was exciting and energizing. We had a visible presence both in poster sessions and parallel sessions. More significant, however, is that the Policy Council, the governing board of the System Dynamics Society, is stepping up their interest and commitment to the K-12 effort.

For many years, the K-12 community has had the support of wonderful system dynamics practitioners and the SDS, with Jay Forrester and George Richardson at the top of the list. This year the PC has appointed a dear friend of K-12, Warren Farr, to head up the interface between the two communities and to help figure out how we should go forward together.

There were presentations and posters that were pertinent to K-12 learning, from those who are closely associated with the CLE and those from abroad who are bringing their expertise and interest to bear on the process of learning system dynamics principles.

Here is a list of interesting and stimulating presentations and posters that we enjoyed (or wish we could have attended) at the conference. The conference proceedings, available from the System Dynamics Society website, <http://www.systemdynamics.org/>, give a more complete description of these, as well as the papers that describe them. Go and have a look; they and others not listed are very illuminating about the far-reaching work being done in system dynamics across the world.

#### Parallel Presentations

*Learning as Conceptual Change During Community Based Group Interventions. A Case Study with Smallholder Farmers in Zambia*, by Gerid Hager, Birgit Kopainsky, Progress Nyanga [Abstract](#).

*Behind Closed Gates: Potential Dynamics When One Individual or Group Is Given Complete Authority Over Another*, by Anne LaVigne, Lees Stuntz [Abstract](#). [Supporting](#).

*Developing Understanding of Dynamic Systems within Early Childhood Settings*, by Anne LaVigne, Tracy Benson, Sheri Marlin [Abstract](#).

*Rethinking Intuition of Accumulation Principles*, by Chris Browne, Paul Compston [Abstract](#). [Supporting](#).

*The More You See the Less You "Get": On The Importance of a Higher-Level Perspective for Understanding Dynamic Systems*, by Helen Fischer, Florian Kapmeier, Mihaela Tabacaru, Birgit Kopainsky [Abstract](#).

*Bathtub Dynamics Revisited: Exploring the Engineering Domain*, by Florian Kapmeier, Meike Tilebein, Roland Maximilian Happach [Abstract](#).

*Does Analytical Thinking Improve Understanding of Accumulation?*, by Arash Baghaei Lakeh, Navid Ghaffarzadegan [Abstract](#).

*ISDC continued on page 10*

# Living Lands – Forest and Town

continued from page 1

- Copy any desired optional handouts. Note that the simulation contains introduction content with suggested investigations and a journal to be completed during the simulation. A final project may be completed. See Assessment Ideas (page 7) for additional detail.
- Log in as the facilitator and test the simulation with a couple of computers before the first class period.

## Introduction

- Describe the project in which students will take on the role of managing a town or forest. Use the introduction slideshow (see separate PPT file and Notes on pages 19-24) and project requirements with rubric (Handout 1, pages 10-11) as desired.
- Have student teams go to the main simulation URL and log in with their assigned IDs and passwords (Figure 1).
- Have students complete all three parts of the introduction section (Figure 3). This section includes a general overview with a video, steps for each round of the game and details about the town or forest setting. Note that the videos are different, depending on the student role (forest or town). Use of headphones will help with sound control. The videos are also available from the teacher administration screens if you prefer to view with the whole class together.
- Vocabulary Exploration: Ask students to do a scavenger hunt for key terms, creating a list in their journals (Figure 4) with definitions and locations other than in the Glossary. Note that students can visit the Glossary at any time by clicking the link on the bottom of any screen.
- Optional:* Completing one or more investigations (Figure 5) will give students background knowledge about key terms and managing fire, both in a forest and in nearby towns. The investigations take students to websites that show how actual forests and towns manage fire. Another option is to have students complete these investigations as part of debriefing the simulation.



Figure 2: Simulation Map



Figure 3: Intro Screen

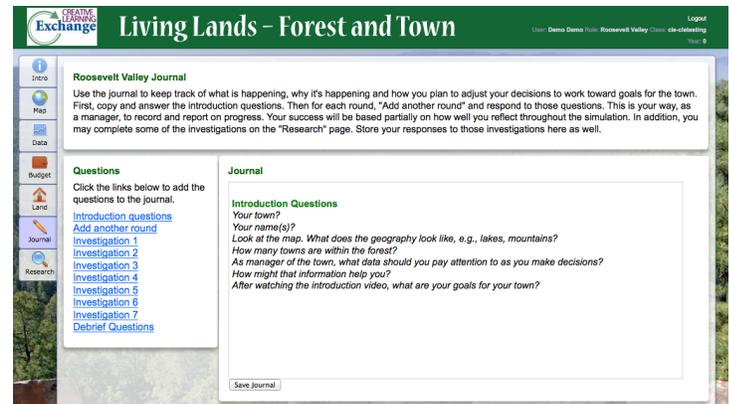


Figure 4: Journal Screen

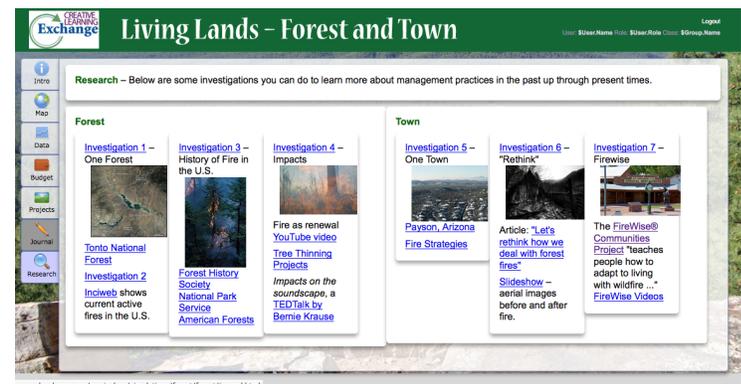


Figure 5: Research Screen

Living Lands continued on page 4

# Living Lands – Forest and Town

continued from page 3

## Running the Simulation

### 1. General Information

Note that each of the decision screens has links to get more information about how that decision impacts other aspects of the system (Figure 6). Encourage students to visit these links to get more information as they make their decisions for each round.

In addition, students should look at the graphs (Figure 7) when each round starts. They won't have any data until the beginning of the second round, but at that point they will be able to consider the trends over time for such variables as population and quality of life. They can also see what is impacting each of these graphs by clicking on them. Encourage students to do this so they can make more informed decisions.

2. Throughout the simulation, remind students to visit the journal to record their results and answer the questions for each round.
3. Run the simulation for the entire 50 years if possible. Refer to the Technical Guide as needed.
4. Debrief the simulation experience using ideas for bringing the lesson home and assessment ideas (page 7).

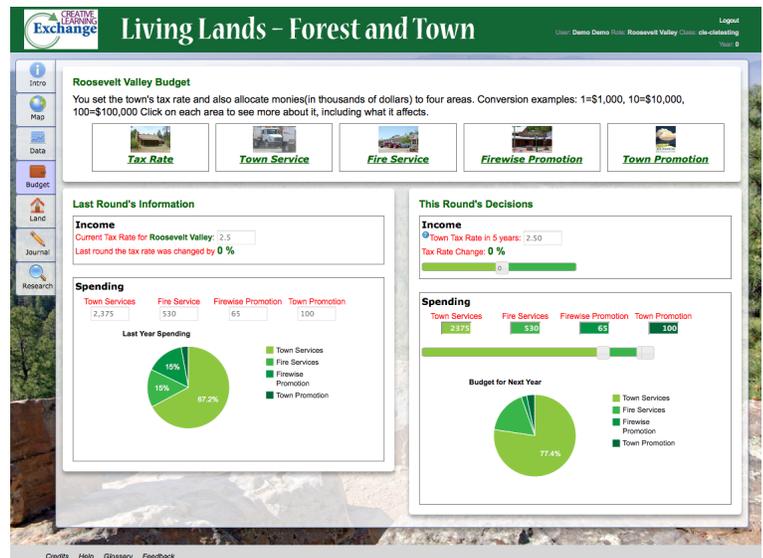


Figure 6: Example Decisions Screen

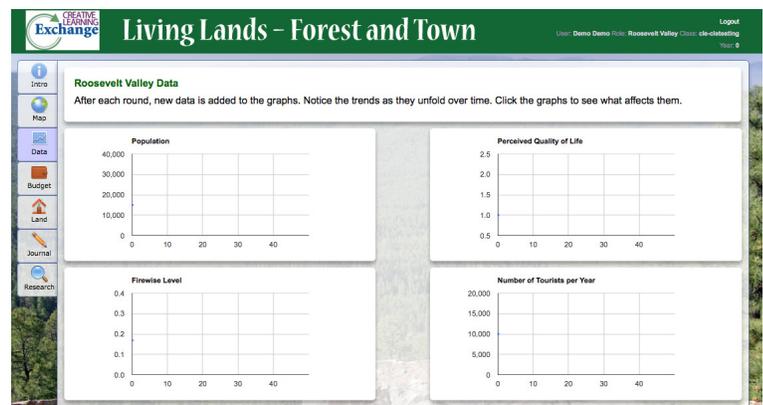


Figure 7: Example Graphs Screen

## Debrief

### Bringing the Lesson Home:

Use the debrief slideshow (see separate PPT file and Notes on pages 25-33) along with graphs from the simulation screens to discuss questions such as:

- What happened to the towns over time? Consider financial success, population, quality of life, damage from fire, etc.
- What happened to the forest over time? Consider financial viability, visitors, damage from fire, etc.
- What affected whether or not a town was hit by fire in any given round?
- What were successful strategies to keep the forest healthy? To make residents happy? To make your town or forest income increase?
- What were benefits and tradeoffs of different strategies?
- How were goals of the simulation in conflict with one another? What challenges did that create?

## Assessment

### Assessment Ideas:

#### 1. Simulation Documentation

Handout 1 on pages 10-11 describes the parts of an assignment that include documenting the simulation in a journal and also choosing one of the projects described:

- Project 1: Written Opinion

Students make recommendations for a town or forest, based on their role in the game. They compose a letter to the governmental leader, (e.g., town mayor, forest manager) describing the issues of managing the area for long-term economic and environmental sustainability and making recommendations for policies to create that outcome. Students need to include evidence from the simulation (in the form of graphs, journal records, website data, etc.) that supports their recommendations. Handout 3 on page 13 is intended as a pre-writing tool for students to explore the impacts of different policies (e.g., prescribed burning, suppression, and firewise education). They will need one copy for each policy they would like to assess. Students may need additional information about how to write this up with a cover letter and attachments.

- Project 2: Radio or Television News Report

Students create an audio or video report to describe what's happening in the forest and the surrounding towns over time. What policies were used by various towns? How did that impact the individual towns and the forest as a whole?

#### 2. Handout 2 – Identify Interdependencies

Identify and describe the interactions among the main simulation elements, starting from a blank paper or using Handout 2 on page 12.

## LIVING LANDS – HANDOUT 1: Project Requirements and Rubrics

### Parts of the assignment

#### 1. Simulation Documentation

- Printed Journal
- Handout 1 – Project Requirements and Rubrics
- Handout 2 – Identify Interdependencies

#### 2. Project Option 1: Recommendation

You have just been hired by a town mayor (or forest manager) to write a recommendation for the town (or forest) regarding the economic and environmental sustainability of the area over the long-term (next 50 years), given the need to manage threats from wildfires.

You'll need:

- Cover letter
- Intro paragraph with greeting
- Three or more recommendations (one paragraph per recommendation) and a conclusion paragraph with signature
- Attachments showing proof for each recommendation. These can be graphs, drawings, maps, etc.

*Living Lands continued on page 6*

# Living Lands – Forest and Town

Handout 1 continued from page 5

**Project Assessment Rubric**

	<b>Novice</b>	<b>Basic</b>	<b>Proficient</b>	<b>Advanced</b>
<b>Journal</b>	I didn't clearly explain what happened or why.	I recorded results that were mostly accurate. I explained what happened.	I recorded results that were accurate. I explained what happened and why my town or forest was or was not successful.	In addition, I am able to connect the simulation results to other real-world situations.
<b>Cover Letter</b>	My letter is missing or very little is included.	I wrote a letter with recommendations, but I didn't include any rationale.	I wrote a clear letter with a well-defined opinion and explanations of evidence. My letter includes all five required paragraphs.	In addition, I gave proof by connecting recommendations to other similar real-world systems.
<b>Evidence</b>	My evidence is not connected to my recommendations.	I have evidence, but it's not clear which recommendation it connects to.	My evidence is clear and shows strong support for my recommendations.	In addition, I have created a labeling system for my evidence, so the letter clearly connects to the attachments.

### 3. Project Option 2: Radio or Television News Report

You have just been hired by a radio station (or television station) to create a news report on what's been happening in the local towns and surrounding forest over the last 50 years. You'll need to include clear explanations of what's happening to the forest and towns over time, along with how decisions have impacted economic and environmental results.

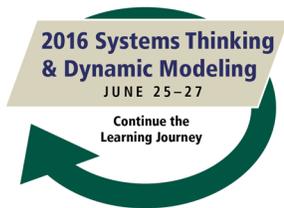
You'll need:

- Copy of your news script
- Audio or television report
- Printed evidence (in the form of graphs or screen shots) showing support for your explanations

**Project Assessment Rubric**

	<b>Novice</b>	<b>Basic</b>	<b>Proficient</b>	<b>Advanced</b>
<b>Journal</b>	I didn't clearly explain what happened or why.	I recorded results that were mostly accurate. I explained what happened.	I recorded results that were accurate. I explained what happened and why my town or forest was or was not successful.	In addition, I am able to connect the simulation results to other real-world situations.
<b>Report</b>	My report is missing or very little is included.	I created a report with an explanation of what happened, but I didn't include any rationale.	I created a clear report that shows what happened and gave rationale.	In addition, I describe how this situation is similar to real-world systems.
<b>Evidence</b>	I did not include any evidence.	I have evidence, but it's not clear what it connects to.	My evidence is clear and shows strong support for my explanations.	In addition, I have created a labeling system for my evidence, so the report clearly connects to the attachments.

*Living Lands continued on page 9*



# Systems Thinking & Dynamic Modeling Conference for K-12 Education

June 25 – June 27, 2016

Babson Executive Conference Center  
Wellesley, Massachusetts

## Continue the Learning Journey

The Systems Thinking and Dynamic Modeling Conference for K-12 Education put on by the Creative Learning Exchange provides resources and opportunities for educators and interested citizens to explore what is current and possible in K-12 systems education.

In the Boston area again in 2016, the 12th biennial ST/DM Conference will host an impressive slate of systems educators and system dynamics professionals.

The focus for this conference will be to extend and expand the knowledge and practice of teaching using the tools and mind-sets of systems thinking and system dynamics.

An introductory workshop will be held at Babson Executive Conference Center on **June 24th**, the day before the conference. This training workshop will include 8 hours on Friday (9 AM to 5 PM), breaks and lunch on Friday, a 3-hour workshop session on Saturday afternoon, and mentorship time scheduled during the conference, tailor-made to help integrate the offerings of the conference. Systems mentors with decades of experience will help integrate the stimulating material and discussion presented throughout the conference.

For over 25 years, the CLE and the Waters Foundation have worked to advance the use of Systems Thinking

and Dynamic Modeling in K-12 education, through curriculum, training and support. Many educators have started down the road of utilizing the powerful tools and attitudes generated originally by the field of system dynamics.

Previous ST/DM conferences, workshops, and training from both the Waters Foundation and the CLE have given a good start to many teachers and administrators focused on maximizing their students potential for critical thinking.

In recent years, the annual Snowball Conference, sponsored by the Sol Education Partnership, in conjunction with the Waters Foundation, the CLE, and others, has augmented the base of educators primed to move forward in the classroom as well as the school organization.

This conference is designed to build on that initial interest and training. Workshops and sessions will include:

- Next steps in utilizing group model building with youths and adults, building on the work at the Brown School of Social Work, Social Science Design Lab.
- Helping students (and beginning teachers) learn the power of modeling.
- A full day introductory workshop before the conference (June 24) to get beginners “up-to-speed.”

- Sessions on how systems thinking and dynamic modeling fit into the bigger picture of those two disciplines.
- How to integrate the concepts and tools of ST/DM into curriculum.
- Curriculum make-over workshops, both with the beginning and more advanced tools of ST/DM.
- Integrating ST/DM tools and mindsets into administration and leadership in the school environment.
- Examples of what students are capable of doing, both in group modeling and in the classroom.

Join us for another instructional and educational conference as we continue the learning journey. System dynamics and systems thinking provide strategies and methodology to explore complexity, connections and change over time. The ST/DM conference will provide attendees with examples, vignettes, and materials to help educators further learning using systems thinking.

For more information, contact [Bunny Lawton \(lawtons@cleexchange.org\)](mailto:lawtons@cleexchange.org) at the *Creative Learning Exchange*, or call us at 978-635-9797. Scholarship applications and registration forms will be available late 2015 or early 2016. **SAVE the DATE!**

# Mosquito Nets for Fishing

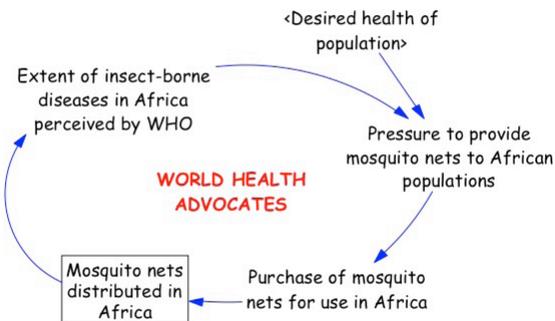
George P. Richardson, University at Albany, SUNY, and the Creative Learning Exchange

Based on <http://www.nytimes.com/2015/01/25/world/africa/mosquito-nets-for-malaria-spawn-new-epidemic-overfishing.html>

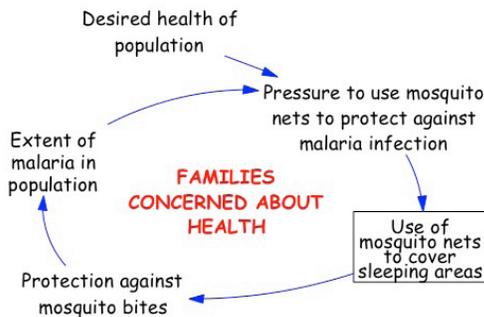
At DynamiQueST in May this year, the group problem-solving session centered around an issue with the use of mosquito netting in Africa. Mosquito nets are widely considered a magic bullet against malaria—one of the cheapest and most effective ways to stop a disease that kills at least half a million Africans each year. But countless fishermen are not using their mosquito nets as global health experts have intended. Instead, they take their families' supply of anti-malaria nets and sew them together into a gigantic sieve that they use to drag the bottom of the swamp ponds, sweeping up all sorts of life: baby catfish, banded tilapia, tiny mouthbrooders, orange fish eggs, water bugs and the occasional green frog.

George Richardson, who has been a friend and supporter of system dynamics in K-12 education for many years, facilitated this session. George thought of looking at the issues through the vantage point of the various stake-holders. He asked the attendees to use tools of system dynamics to look at the issue. This is a series of maps that George used in his thinking.

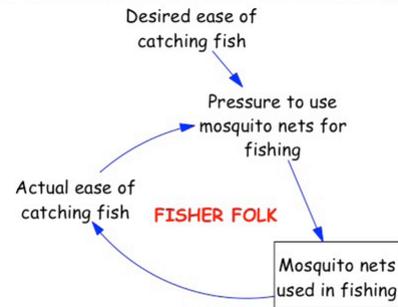
## Some Stakeholder Goal-Seeking Loops



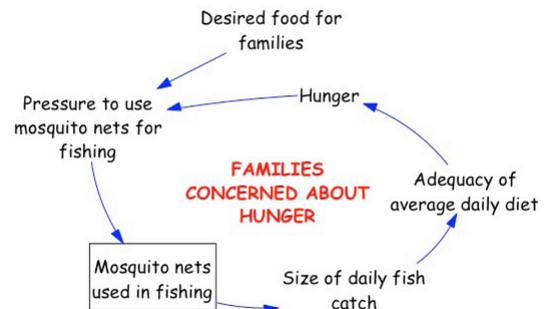
## Some Stakeholder Goal-Seeking Loops



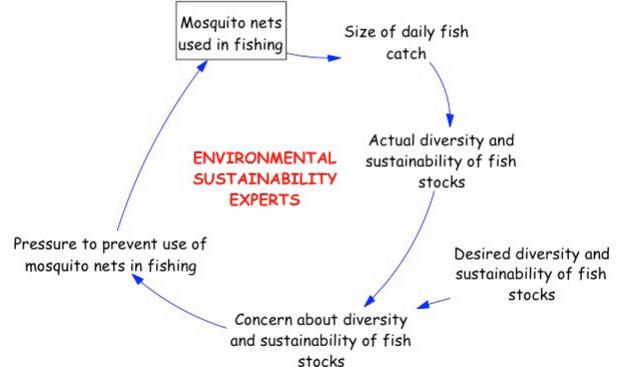
## Some Stakeholder Goal-Seeking Loops



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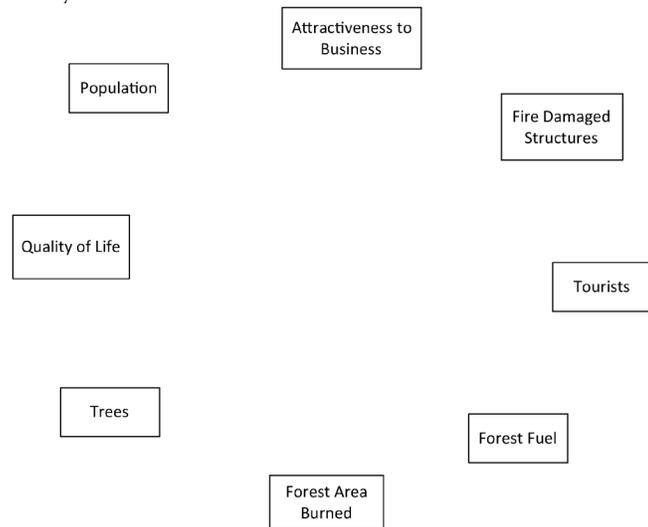


# Living Lands – Forest and Town

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## LIVING LANDS – HANDOUT 2: Identify Interdependencies

Given these parts of the simulation, what are some cause and effect relationships? Draw an arrow from a cause to an effect. Can you find any loops? That is, starting with one variable, see if you can follow the arrows around until you get back to the original variable. Also, add how your decisions (for either the town or the forest) affect parts of the system above.



### Town Decisions

- Town Fire Service
- Firewise Outreach
- Town Promotion
- Rezoning Land
- Town Services
- Tax Rate

### Forest Decisions

- Visitor Education
- Tree Thinning
- Prescribed Burning
- Suppression
- Personal and Equipment
- Day Use Fee

## LIVING LANDS – HANDOUT 3: Consider Impacts

Policy: \_\_\_\_\_

### Impact on the Economy:

Short-Term

Long-Term

### Impact on the Environment:

Short-Term

Long-Term

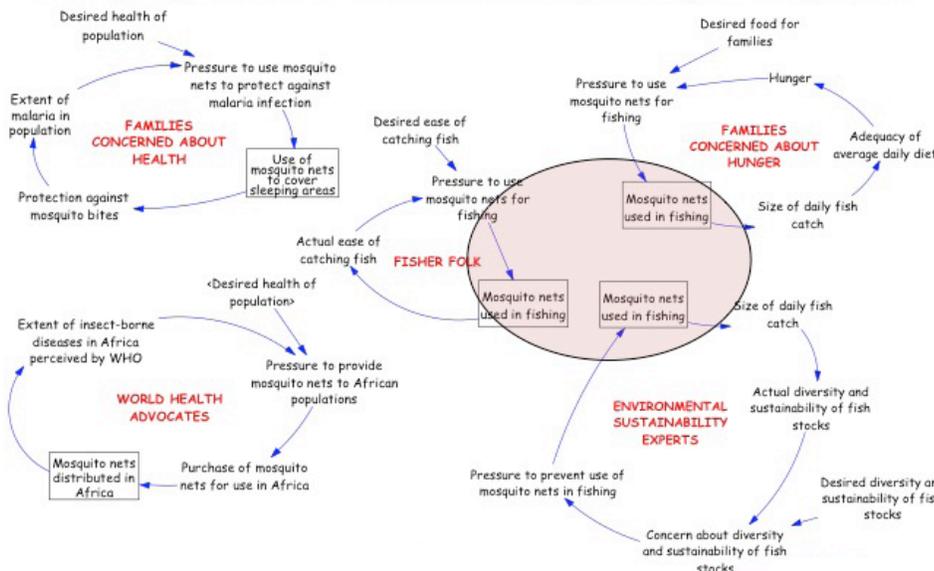
### Other Impacts:

Short-Term

Long-Term

The overview of the lesson and the three handouts are only a part of the Living Lands lesson. These, together with the Technical Guide, the Intro and Debrief Slideshows, comprise the lesson materials which accompany the online simulation. The guide is available on the CLE website, [www.clexchange.org](http://www.clexchange.org). The URL for the simulation is <http://www.clexchange.org/curriculum/simulations/livinglands.asp>.

## Bringing All the Goal-Seeking Loops Together



For all the maps, visit the [CLE website](http://www.clewebsite.com), and for the entire news article, visit <http://www.nytimes.com/2015/01/25/world/africa/mosquito-nets-for-malaria-spawn-new-epidemic-overfishing.html>.

# International System Dynamics Society Conference

continued from page 2

*Unpacking the Black Box of Causality: What is it We Assume with Every Link?*, by Christian Hugo Hoffmann, Stefan Groesser [Abstract](#). [Link from authors](#).

*Learning Economics with Dynamic Modeling. A Norwegian-Ukrainian Collaboration Project*, by Iaroslava Stelmashenko, Iryna Lukianenko, David Wheat [Abstract](#). [Paper](#).

*Transforming Race 2015: How System Dynamics is Helping to Shape the Response to Ferguson, MO*, by Megan Odenthal, Nancy Zoellner, Saras Chung, Jill Kuhlberg, Peter Hovmand [Abstract](#).

## Poster Presentations

*Pre-College Student Understanding of Accumulations: An Experiment at a WPI Summer Workshop for Students*, by Diana Fisher [Abstract](#).

*Developing Question Sets to Assess Systems Thinking Skills*, by Kiumars Dorani, Armina Mortazavi, Mohammad Amin Dehdarian, Hesam Mahmoudi, Masoomeh Khandan, Ali Mashayekhi [Abstract](#). [Paper](#).

*A Learning Science-based Protocol for Evaluation of a Sustainability-based Learning Environment*, by Eliot Rich, Reza Behnagh, Babak Bahaddin, Mahdi Najafabadi, Michael Deegan, Rod MacDonald, Luis Luna-Reyes, David Andersen [Abstract](#).

*Population Dynamics in History: Connecting Past, Present, and Future*, by P. Jeffrey Potash, Jennifer Andersen, Lees Stuntz [Abstract](#). [Supporting](#). [Link from Authors](#).

*The Capability Traps in Explaining the Capability Trap: Lessons from the Field on Conveying Generalizable System Insights*, by Peter Hovmand, Laura Guzman-Abello, Camilo Olaya, Wolfgang Munar, Mary Jo Stahlschmidt [Abstract](#).

*Why Do We Slip in the Bathtub? - Explanation of Stock-Flow Failure Based on Systems with Life*, by Tiru Arthanari [Abstract](#). [Paper](#).

## Newsletter Subscription Information

The Creative Learning Exchange newsletter is available in two formats:

- On the website at [www.clexchange.org](http://www.clexchange.org)
- In paper format via US mail (\$15.00 outside the USA)

The newsletter is always on the website for downloading. An e-mail is sent to subscribers when a new issue has been posted. Please e-mail us at any time when you would like to have an electronic subscription.

[info@clexchange.org](mailto:info@clexchange.org)

## Interested In Investing?

If you would like to invest in our effort here at *The Creative Learning Exchange*, your contribution would be appreciated. You may donate any amount you wish; perhaps \$50.00 is a reasonable amount for a year. All contributions are tax-deductible.

Enclosed is \_\_\_\_\_ to *The Creative Learning Exchange* to help invest in the future of K-12 systems education.

Name \_\_\_\_\_

Address \_\_\_\_\_

E-mail \_\_\_\_\_

THANK YOU!

The Creative Learning Exchange, 27 Central Street, Acton, MA 01720

## The Creative Learning Exchange

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