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The Great Lakes Forestry Centre (GLFC)
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Comings and Goings

Overview
Research scientists Dr. Ian Thompson (wildlife biology) and Dr. Dave Kreutzweiser (aquatic ecotoxicology) have retired. We welcome Dr. Erik Emilson to work in the area of aquatic ecology and entomologist Dr. Barry Cooke.

Dr. Ian Thompson was a wildlife biologist and published numerous papers on biodiversity, climate change and ecosystem management. In particular, he provided recommendations for managing forests for caribou and marten habitat. His papers can be accessed on the publications website.

Dr. Dave Kreutzweiser was involved in numerous studies that investigated the effects of forest management practices on aquatic ecosystems. These included the effects of forest harvesting on water bodies and riparian zones and the environmental fate and persistence of various forest pesticides. More recently, he was involved in a study that evaluated the effects of emerald ash borer infestations in ecologically sensitive areas such as forest ravines and wetlands. To view his numerous papers, visit the publications website.

Dr. Erik Emilson started working as a research scientist in forest aquatic ecology at GLFC in May. Erik completed his Masters (Biology) and PhD (Boreal Ecology) at Laurentian University. He recently returned from Cambridge, UK after a 3 year term as a Research Associate at the University of Cambridge. His research focused on the impacts of forest alteration on aquatic food webs and carbon dynamics. He is developing a program of research at CFS to investigate the cumulative impacts of forest management, natural disturbance, and climate change on aquatic ecosystem function and integrity, with study sites in the Turkey Lakes watershed and in northern New Brunswick.

Dr. Barry Cooke will be working as a research scientist with the Integrated Pest Management Division and began his new duties in early September. Barry was originally at GLFC as a summer student in the late 1980s and then spent 15 years with the Canadian Forest Service in Edmonton. He has returned to Ontario with the resurgence of the spruce budworm outbreak cycle in the northeast region.

Measuring droplets to study effectiveness of water bombers

Overview
Fire scientists are using highly sensitive infrared cameras to closely examine the way water disperses as it is released from various water bombers.

GLFC fire scientists Dr. Josh Johnston and Dr. Mike Wotton are assisting the Ontario Ministry of Natural Resources and Forestry (OMNRF) in studying the effectiveness of various fire-fighting aircraft. In late June, researchers set up a system of containers around an experimental drop zone at the Regional Airport in Dryden, Ontario. A highly sensitive infrared camera was mounted at the top of a portable tower system and was used to map the footprints of various water bomber aircraft, including the CL-215, CL-415, Twin Otter, Air Tractor 802 Fireboss and the Bell 212 helicopter equipped with belly tanks. A group comprising CFS and FPInnovations researchers and staff from the OMNRF Dryden Fire Centre measured how the water hit the ground, the pattern it formed, and the amount of water in each part of it. They are also looked at how long it took for that water to evaporate.
It is hoped that the study will lead to an understanding of the most cost effective use of the different types of water bombers. The information gathered will be used to continue to develop a practical and efficient way to measure water bomber drops and to model the effects of water drops in a variety of scenarios. In the future, it may also be used to measure the effect of different drops on fire intensity.

In the near future the team will reassemble in Dryden to study the effects of dropping water on forested sites, and to use similar techniques to measure the impact these drops have on active flame fronts. View the YouTube video on this project: Air tanker effectiveness evaluation by using infrared.

Note: Some of the research being carried out by Josh and the GLFC fire team will be featured in an upcoming documentary: "Where there's smoke, there's science!" to be aired on the CBC's The Nature of Things in the fall of 2017. You can also view the short video "Fighting with fire" which aired on TVO's Climate Watch Shorts Aug 12, 2017. "Climate change is leading to hotter, drier summers and creating the ideal conditions for forest fires. Joshua Johnston, a forest fire research scientist with the Canadian Forest Service, is studying wildfires with an eye toward the future, when fires are likely to be more frequent and intense. You can also view it on the @WildfireScience Twitter account.

GLFC Science is on Twitter

If you are a Twitter follower, find regular updates on @GLFCscience. Many field work studies were highlighted over the summer.

Cell phone technology used to track budworm

Overview
Cameras installed in spruce budworm traps baited with pheromones are being used to monitor the flight behaviour of spruce budworm moths.

In five locations across Ontario and Quebec, including the roof of the GLFC building, the flight patterns of budworm moths are being recorded using pheromone traps equipped with cameras and cell phone connection to the internet. Every hour, the traps send pictures of the moths caught on the sticky paper to a computer server where they are stored and processed. The pictures are accessible through a website allowing researcher Dr. Jean-Noel Candau to remotely monitor how many moths are in the traps and at what time of day they arrived. The advantage of this system is that the information is received without actually going out in the field to check the traps, which can be time consuming and costly. The information gathered will be useful in improving our understanding of the factors affecting moth flight and ultimately assist in improved control of spruce budworm outbreaks. This project work was developed in conjunction with a Slovenian company that is developing similar technology for agricultural applications.


Internet - connected pheromone trap. Solar panel provides power for cell phone connection to the internet (left). Example of an image sent by a trap located on the southern shore of the St. Lawrence, showing the captures on July 25th 2017 between 11:00 and 12:00 pm (right).

Canadian National Vegetation Classification (CNVC) updates

Overview

As work is progressing on the CNVC, factsheets for vegetation types can be viewed on line.

The CNVC is a systematic, hierarchical way of classifying and describing vegetation that allows for a common reference in comparing ecosystems within Canada and internationally. Some of the work currently underway includes the development of factsheets that define and describe forest and woodland types at two levels of the hierarchy (level 5, Macro-group and level 8, Association). The factsheets provide a summary of the ecological attributes of the type, including information on vegetation composition and structure, plant species composition, environmental context, geographic distribution, and ecological process relationships (e.g. disturbance regime). The types can therefore serve as descriptions of baseline conditions for studies of climate change on particular ecosystems. As well, because they correlate existing provincial/territorial vegetation types, where they exist, they can help users relate types among jurisdictions (i.e., compare apples to apples). Ultimately, there will be a factsheet available for every unit within the hierarchy.

For example Macrogroup 495, "Eastern North American Boreal Forest" (level 5 in the hierarchy) describes upland boreal forests and woodlands in eastern Canada, which range from southeastern Manitoba to Atlantic Canada. An example of the finest scale of classification (level 8 in the hierarchy), is the Association CNVC00127 "Jack Pine / Velvet-leaved Blueberry / Common Bearberry / Reindeer Lichens" which is a West-Central Boreal Association that ranges from Alberta to Ontario.
For more information, visit the CNVC website.

Bird Monitoring – Point Counts and Acoustic Recorders

Overview
Forest ecosystem biologist Ken McIlwrick travelled to northwest New Brunswick in the spring to provide direction, training and assistance in conducting forest bird point count surveys and the establishment of acoustic forest bird monitoring recorders.

The field portion of a collaborative NSERC (Natural Sciences and Engineering Research Council of Canada) project between Carlton University, University of New Brunswick, J.D. Irving Ltd. (Woodlands Division) and the Canadian Forest Service is now complete. The goal of this project is to map out bird habitat for a suite of indicator species on an area of the company's managed lands known as the Black Brook Forest. Parallel to this project, the researchers will be examining likely chronosequences of this forest under alternative management scenarios. Ultimately the goal is to predict how bird habitat will change through time under those alternative scenarios, all the while providing insight into how we can improve forest management options for conserving biodiversity.

Ken directed and assisted a graduate student in getting the field program established and provided essential point count survey training, including bird identification through songs, calls, non-vocal sounds, visual cues, behaviour and habitat preferences. Ken also provided training in the preparation, set-up, programming, tracking, installation, removal and disassembly of automated field audio recorders. These recorders, known as Song Meters, are small, weatherproof, programmable recording units that can be left in remote sampling locations to collect auditory data on a predefined recording schedule. This technology allows for data to be collected simultaneously over large areas and over longer time frames than an individual could complete and allows for data analysis at a later date. Since these audio recordings are stored in a digital format, they can be scanned using digital bird song recognizers (developed in-house at GLFC) and specialized computer software for the occurrence of select bird species. This automated scanning reduces the need for technicians experienced and skilled in auditory bird identification.

Indigenous Forestry Initiative (IFI) and the Strategic Partnerships Initiative (SPI)

Overview
The Indigenous Forestry Initiative is a program that provides funding to support the economic development of Indigenous peoples in Canada.

The Indigenous Forestry Initiative is a program that provides funding to support the economic development of Indigenous peoples in Canada. The activities funded promote greater participation by Indigenous communities in all natural resource sectors, especially the forest sector. Proposed projects must be aimed at achieving economic development through one of the three activity areas: clean technology and participation in the forest bioeconomy (e.g. a project that promotes using biomass for heat and power to reduce reliance on diesel fuel); environmental stewardship (e.g. a project that focuses on climate change mitigation and adaptation, land reclamation, or environmental/ecological services); and use and management of forest resources (e.g. a project that gives people in the community training in forest management). As well, eligible projects must have at least one partner (e.g. federal or provincial government, industry, or research organization) that has agreed to contribute financially or with in-kind goods or services. Projects currently in development in Ontario involve business planning to explore joint ventures with industry and upgrades to Indigenous sawmills, which will assist with product development. Simultaneously, support is provided to upgrade safety training and equipment to current standards to provide a safe place of employment.

In parallel, the Strategic Partnerships Initiative (SPI) is funding three projects in Ontario through the Remote Forest Biomass Initiative, which will support Indigenous communities entering into the bioeconomy.

For more information, contact the Indigenous Forestry Initiative, where you will also find a list of Regional Coordinators.

GLFC fire research staff give international workshops

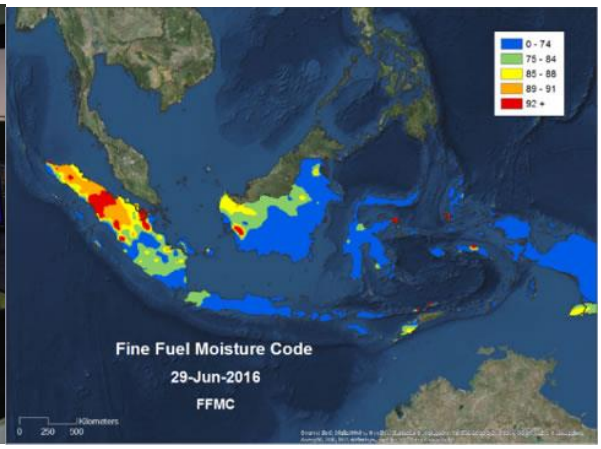
Overview

Fire and climate change team members were primary presenters in a series of workshops held over the last few years in Armenia, Indonesia, Malaysia and Mexico that provided training and technology support for fire danger rating systems (FDRS).

The FDRS used in these countries are based primarily on the Canadian Fire Weather Index (FWI) System. In October 2016, GLFC staff provided technology training in software to help with wildland fire early warning systems in Yerevan, Armenia. Their participation was supported by the Organization for Security and Co-operation in Europe. The workshop was attended by the Armenian Hydromet Department and a delegation from Georgia's National Forestry Agency. After a refresher on the FWI, two days were dedicated to the installation and training on a GIS-based FWI calculator and mapper, which had been produced by the GLFC fire and climate change group.

In February 2017, a five-day workshop sponsored by the Canadian Embassy and hosted by the Indonesian Agency for Meteorology, Climatology and Geophysics was held in In Jakarta, Indonesia. It allowed for in-depth FWI and FDRS presentations and training prior to the software installation. By the end of the workshop over thirty installations of the GLFC-made GIS FDRS software were completed, including one on the Agency's computers dedicated to run this system for Indonesia. The Canadian Ambassador to Indonesia and a number of directors for the participating Indonesian agencies were in attendance for the first day to open the workshop to demonstrate the importance of this workshop to both countries.

Following the Indonesian workshop, a stopover in Kuala Lumpur was organized to visit the Malaysia Meteorological Service for a one-day workshop sponsored by GLFC, for training on the new software and installation of the FWI calculator on their primary server. This agency maintains the current and future FDRS for the Association of South East Asian Nation countries.
In March 2017, the Mexican National Commission of Forestry hosted a workshop in Guadalajara, Mexico, which allowed for information exchange, GIS FDRS software installation and instruction on wildland fire in Mexico and tools to support wildland fire management.



Fire and climate change team members Alan Cantin and Natasha Jurko assisting with fire danger rating system software installation in Jakarta, Indonesia (left). The map is an example of the information that can be generated and shows the Fine Fuel Moisture Code (one of the key components of the Fire Weather Index) on a map of Indonesia (right).

Canadian Institute of Forestry hosts teachers' tour

Overview
GLFC staff assisted with the Canadian Institute of Forestry's 17th annual Teachers' Forestry Tour August 8-11, 2017. The annual tour, based out of the Canadian Ecology Centre in Samuel de Champlain Provincial Park near Mattawa, Ontario is an excellent opportunity to inform teachers about forest management and forest science.

The tour consisted of presentations, field and mill tours, and social events over the four days. Presentations included "Forestry 101", forest certification, tree identification, the Ontario Invasive Species Centre and new innovations in wood products. Mill tours of Columbia Forest Products' veneer mill in Rutherglen, Ontario and Tembec's mill in Temiscaming, Quebec were offered. Field tours in the Ottawa Valley Forest (visiting clearcut and planting areas), Nipissing Forest (visiting an active shelterwood harvesting area) and the Petawawa Research Forest (visiting historical sample plots, the arboretum, and shelterwood and biomass study sites) were excellent opportunities to view forestry practices first-hand.

As the tour progressed, each attendee was able to learn about the various forest regions in Ontario and the tree silvics associated with species found within those regions. This information allowed them to gain a basic understanding of why the forests are managed using the various silvicultural systems (clearcut, shelterwood, selection) for each forest type. Feedback received from the participants told us that what they learned about forest silviculture, combined with the opportunity to have open dialogue with forest professionals, the chance to meet loggers in the woods, people working in the mills and seeing first hand forests being harvested and regrown not only left the teachers with a greater sense of trust but also a real sense of pride in the Canadian forest sector and the products that are produced from them.

The CFS was one of many organizations that supported the event. In addition to a financial contribution and providing educational materials, CFS staff provided presentations on forestry and forest science and a tour of the Petawawa Research Forest.

GLFC hosts a seed zone workshop

Overview
A workshop to review Ontario's seed zone policy was held at GLFC in late August.

Researchers Dr. Dan McKenney and John Pedlar have been helping Ontario Ministry of Natural Resources and Forestry (OMNRF) staff with the review of their seed zone policy. With uncertainty in future climate, the movement and transfer of seed sources is becoming an ever more important part of forest management. Approximately 30 OMNRF staff, industry and NGO representatives as well scientists from other parts of Canada and the US attended the workshop.

Upcoming Webinar

November 15th: John Pedlar, 1:30 pm Eastern
Assisted Migration as a Tool for Climate Change Adaptation presentation (part of the CIF lecture series)

John works as a forest biologist for GLFC. His work focuses on species distribution modelling and forest responses to climate change. Recently he has been a member of two CFS task groups that have explored topics such as assisted migration and the implications of climate change for timber supply in Canada. John has an MSc in landscape ecology from the University of Carleton and a BSc from the University of Guelph.

Publications of interest

Release of parasitic wasps for biological control of the emerald ash borer in Canada.
The use of introduced biological control agents is one method being explored to help reduce the spread and growth of emerald ash borer populations. Two species of parasitic wasps (parasitoids) from the native range of emerald ash borer are currently being evaluated in Canada.

Influence of ignition type on fire behavior in semi-mature jack pine.
Many experimental burns were conducted by CFS in the development of the Fire Behaviour Prediction System. To best emulate larger wildfires most of these fires were line-ignition type burns. This allowed the fire to quickly reach a steady state rate of spread. In reality, most fires start as small point-source ignitions (e.g. lightning, cigarette, etc), often the only period of time fire suppression resources can easily control them when fire danger is high. Therefore, CFS fire researchers at the time (1984-1991), performed a number of point source ignition experimental burns and compared to line source ignitions.

Publications

- To order copies of these publications, please contact the Great Lakes Forestry Centre publications assistant.
- Publications are available in English unless otherwise indicated.

Recent Publications

Barber, K.N.; Bouchard, P. 2017. The European *Euglenes pygmaeus* (De Geer) (Coleoptera: Aderidae) in North America. Scientific note – *Coleopterists' Bulletin* 71(1):204-206.

Bittner, T.D.; Hajek, A.E.; Haavik, L.J.; Allison, J.D.; Nahrung, H. 2017. Putative multiple introductions of Sirex noctilio (Hymenoptera: Siricidae) in northeastern North America based on microsatellite genotypes, and implications for biological control. *Biological Invasions* 19(5):1431-1447.

Bouwer, M.C.; Slippers, B.; Wingfield, M.J.; Allison, J.D.; Rohwer, E.R. 2017. Optimization of pheromone traps for *Coryphodema tristis* (Lepidoptera: Cossidae). *Journal of Economic Entomology*.

Duan, J.; Quan, G.; Mittapalli, O.; Cusson, M.; Krell, P.J.; Doucet, D. 2017. The complete mitogenome of the emerald ash borer (EAB), *Agrilus planipennis* (Insecta: Coleoptera: Buprestidae). *Mitochondrial DNA* 2(1):134-135

Emilson, C.E.; Kreutzweiser, D.P.; Gunn, J.M.; Mykytczuk, N.C.S. 2017. Leaf-litter microbial communities in boreal streams linked to forest and wetland sources of dissolved organic carbon. *Ecosphere* 8(2):1-12.

Fournier, R.E.; Turgeon, J.J. 2017. Surveillance during monitoring phase of an eradication programme against *Anoplophora glabripennis* (Motschulsky) guided by a spatial decision support system. *Biological Invasions*. DOI: 10.1007/s10530-017-1505-2.

Guzmán-Larralde, A.J.; Huber, J.T.; Martínez, H.Q. 2017. Generic key and catalogue of Mymaridae (Hymenoptera) of Mexico. *Zootaxa* 4254(1):1-38.

Haavik, L.J.; Dodds, K.J.; Allison, J.D. 2017. Suitability of eastern pines for oviposition and survival of *Sirex noctilio* F. *Plos One* 12(3).

Hanes, C.C.; Jain, P.; Flannigan, M.D.; Fortin, V.; Roy, G. 2017. Evaluation of the Canadian Precipitation Analysis (CaPA) to improve forest fire danger rating. *International Journal of Wildland Fire* 26(6):509-522.

Hannam, K.D.; Venier,L.; Hope, E.; McKenney, D.; Allen, D.; Hazlett, P.W. 2017. AshNet: Facilitating the use of wood ash as a forest soil amendment in Canada. *Forestry Chronicle* 93(1):17-20.

Holmes S.; McIlwrick, K.; Kreutzweiser, D.; Venier, L. 2017. Riparian partial harvesting and upland clearcutting alter bird communities in a boreal mixedwood forest. *Forests* 8(5):1-16.

Hope, E.; Barsi, D.; McKenney, D. 2017. Adoption and impact pathways for Canadian Forest Service genomics research and development initiative projects. Natural Resources Canada, Canadian Forest Service. Information Report GLC-X-18, 59p.

Hope, E.; Barsi, D.C.; McKenney, D.W. 2017. Assessing the adoption and impact of genomics research at the Canadian Forest Service. *The Forestry Chronicle* 93(2):118-121.

Hope, E.S.; McKenney, D.W.; Allen, D.J.; Pedlar, J.H. 2017. A cost analysis of bioenergy-generated ash disposal options in Canada. *Canadian Journal of Forest Research* 47:1222-1231.

Huber, J.T. 2017. Biodiversity of Hymenoptera. *Insect Biodiversity: Science and Society* 1(2):419-461.

Huber, J.T. 2017. Eustochomorpha Girault, Neotriadomerus, gen. n., and Proarescon, gen. n. (Hymenoptera: Mymaridae), early extant lineages in evolution of the family. *Journal of Hymenoptera Research* 57:1-87.

Huber, J.T.; Islam, N. 2017. Introduction to the Mymaridae (Hymenoptera) of Bangladesh. *Zookeys* 675:75-96.

Johnston, J.M.; Wooster, M.J.; Paugam, R.; Wang, R.; Lynham, T.J.; Johnston, L. 2017. Direct calculation of Byram's fire intensity from infrared remote sensing imagery. *International Journal of Wildland Fire* 26(8) 668-684.

Lagerquist, R.; Flannigan, M.D.; Wang, X.; Marshall, G.A. 2017. Automated prediction of extreme fire weather from synoptic patterns in Northern Alberta, Canada. *Canadian Journal of Forest Research* 47(9): 1175-1183.

Laigle, I.; Aubin, I.; Brose, U.; Digel, C.; Boulangeat, I.; Gravel, D. 2017. Species traits as drivers of food web structure. *Oikos* 216(8).

Lee, J.; McKenney, D.W.; Pedlar, J.H.; Arain, M.A. 2017. Biophysical and economic analysis of black spruce regeneration in eastern Canada using global climate model productivity outputs. *Climate Change* 8(4):106.

McRae, D.J.; Stocks, B.J.; Hartley, G.R.; Mason, J.A.; Lynham, T.J.; Blake, T.W.; Hanes, C.C. 2017. Influence of ignition type on fire behavior in semi-mature jack pine. Natural Resources Canada, Canadian Forest Service, Great Lakes Forestry Centre, Sault Ste. Marie, Ontario. Information Report GLC-X-19, 23p.

Palanivel, S.; Manickavasagam, S.; Huber, J.T. 2017. Review of Allanagrus Noyes & Valentine (Hymenoptera: Mymaridae) with a key to species. *Zootaxa* 4299(4):507-520.

Pedlar, J.; McKenney, D. 2017. Assessing the anticipated growth response of northern conifer populations to a warming climate. *Scientific Reports* 7:43881.

Quan, G.; Duan, J.; Ladd, T.; Krell, P.J. 2017. Identification and expression analysis of multiple small heat shock protein genes in spruce budworm, *Choristoneura fumiferana* (L.) Cell Stress and Chaperones. DOI: 10.1007/s12192-017-0832-7.

Rodriguez-Gil, J.L.; Prosser, R.; Poirier, D.; Lissemore, L.; Thompson, D.; Hanson, M.; Solomon, K. 2017. Aquatic hazard assessment of MON 0818, a commercial mixture of alkylamine ethoxylates commonly used in glyphosate-containing herbicide formulations. Part 1: Species sensitivity distribution from laboratory acute exposures Environmental Toxicology and Chemistry 36(2):501-511.

Rolando, C.A.; Baillie, B.R.; Thompson, D.G.; Little, K.M. 2017. The risks associated with glyphosate-based herbicide use in planted forests. *Forests* 8(6):208.

Ryall, K. 2017. Release of parasitic wasps for biological control of the emerald ash borer in Canada. Frontline Express. Natural Resources Canada, Canadian Forest Service, Great Lakes Forestry Centre, Sault Ste. Marie, Ontario. *Frontline Express* 82, 2p.

Tripti, S.; Dedes, J.; MacQuarrie, C. 2016. A modified technique for rearing wood boring insects permits visualization of larval development. *The Journal of the Entomological Society of Ontario* 147:7-14.

Wang, X.; Wotton, M.; Cantin, A.; Parisien, M.; Anderson, K.; Moore, B.; Flannigan, M. 2017. An R package for the Canadian Forest Fire Danger Rating System. *Ecological Processes* 6(5):1-11.

Wilhelm, R.C.; Cardenas, E.; Maas, K.R.; Leung, H.; McNeil, L.; Berch, S.; Chapman, W.; Hope, G.; Kranabetter, J.M.; Dubé, S.; Busse, M.; Fleming, R.; Hazlett, P.; Webster, K.L.; Morris, D.; Scott, D.A.;

Mohn, W.M. 2017. Biogeography and organic matter removal shape long-term effects of timber harvesting on forest soil microbial communities. *ISME Journal*. DOI: 10.1038/ismej.2017.109.

Wotton, M.; Flannigan, M.; Marshal, G. 2017. Potential climate change impacts on fire intensity and wildfire suppression thresholds in Canada. *Environmental Research Letters* 12(9).

Yemshanov, D.; Haight, R.G.; Koch, F.H.; Lu, B.; Venette, R.; Fournier, R.E.; Turgeon, J.J. 2017. Robust surveillance and control of invasive species using a scenario optimization approach. *Ecological Economics* 133:86-98.

Zhou, Z.; Li, Y.; Yuan, C.; Doucet, D.; Zhang, Y.; Qu, L. 2017. Overexpression of TAT-PTD-diapause hormone fusion protein in tobacco and its effect on larval development of Helicoverpa armigera (Lepidoptera: Noctuidae). *Pest Management Science* 73(6):1197-1203.

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