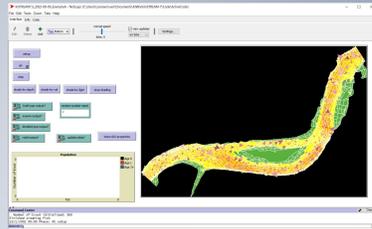
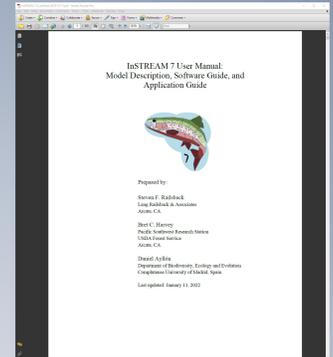


# InSTREAM and InSALMO Software



## The User Manual

- Complete model description
- Software guide
- Application guide (study sites, input, calibration, designing and analyzing simulation experiments, validation, uncertainties...)
- A living document. Current versions at: <https://ecomodel.humboldt.edu>



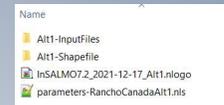
## NetLogo is:

- The most popular software platform for individual-based (“agent-based”) modeling
- Provided free by Northwestern U. (but please donate!)
- A graphical user interface
- A high-level, simple, powerful programming language with hundreds of built-in modeling commands
- Comprehensive documentation and support
- A large, active user community



## InSTREAM’s “Projects”

- A project is a directory tree with:
  - The NetLogo file (model code, graphical interface)
    - Usually customized for each application
  - A parameter file
  - A set of input files
  - A GIS shapefile
  - Output files
- Keep a separate project for each application, including separate analyses of the same site



## Now:

- Look at distributed project: Exercise 1
- Open the model
- Tabs: Interface, Info, Code
- Interface buttons and switches
- Random number seed
- Setup, go, step
- Inspectors
- Code tab
- Parameter file

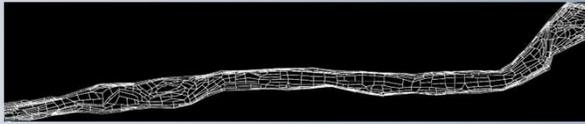
## Input files

Name	Date modified	Size
Shapefile	5/13/2022 7:33 AM	
CC3_TimeSeriesInputs-Std.csv	2/26/2020 10:39 AM	122 KB
CC3C-InitialPopulations.csv	4/18/2020 2:36 PM	1 KB
CC3-Depths.csv	6/26/2020 2:45 PM	240 KB
CC3-Wels.csv	6/26/2020 2:45 PM	239 KB

- All input files use:
  - .CSV format, for editing in Excel etc. (except shapefile)
  - Metric units (m)

## Shapefile

- A standard ARC GIS shapefile with:
  - Cell boundaries as polygon features
  - Static cell habitat variables as polygon properties



## Depth and velocity files

- Lookup tables of cell depth and velocity over a wide range of flows
- Generated by any hydraulic model & GIS

Flow (m/s)	Depth (m)	Velocity (m/s)
1	0.0002	0.0005
2	0.0078	0.0563
3	0.0946	0.2229
4	0.4654	0.5705
5	0.4903	0.5979
6	0.4843	0.5946
7	0.4607	0.5771
8	0.4427	0.5483
9	0.4534	0.5544
10	0.4293	0.5305
11	0.3874	0.3966
12	0.3798	0.4610

1.42 m/s = 50 cfs



## Time series inputs

- This file defines the flow, temperature, and turbidity scenario
- Values can be daily, hourly, weekly...

Date	temperature	flow	turbidity
10/1/1999 12:00	13.1	6.37	2
10/2/1999 12:00	13.2	5.69	1
10/3/1999 12:00	13.1	5.72	1
10/4/1999 12:00	13.2	5.72	1
10/5/1999 12:00	12.7	5.72	1
10/6/1999 12:00	13	5.75	2
10/7/1999 12:00	12.7	5.72	1
10/8/1999 12:00	13.1	5.72	1
10/9/1999 12:00	13	5.69	1
10/10/1999 12:00	13.1	5.69	1
10/11/1999 12:00	13	5.69	1
10/12/1999 12:00	12.9	5.69	1
10/13/1999 12:00	12.7	5.69	1
10/14/1999 12:00	12.8	5.69	1
10/15/1999 12:00	12.4	5.69	1
10/16/1999 12:00	11.9	5.69	1
10/17/1999 12:00	11.9	5.69	1



## Initial populations

- How many fish, of which species and age, are created in each reach at the start of a simulation

Species	Reach	Age	Number	Length min	Length mode	Length max
Rainbow	ClearCrk3C	0	400	4	6.1	7
Rainbow	ClearCrk3C	1	50	9	12	15
Rainbow	ClearCrk3C	2	50	15	17	25



## Output files

- All outputs are in .CSV format
- Each model run (click on "setup") creates unique output file names:
  - BriefPopOut-08-23-16.734\_AM\_13-May-2022.csv
  - ReddSummaryOut-08-23-16.734\_AM\_13-May-2022.csv
  - BriefPopOut-08-33-23.225\_AM\_13-May-2022.csv
- Understanding results usually requires a variety of analyses, so output files provide raw "data" in formats that facilitate many kinds of analysis
  - Excel PivotTables



## Brief population output

Time Step	Reach	Flow	Temperature	Turbidity	Species	Age class	Count	Mean length	Mean weight	Mean condition	Feeding	Fraction Searched	Fraction Hiding
1	0	0	12.1104	0.0002	Rainbow	Age-0	400	5.28353	2.12709	1	0	0	1
2	0	0	12.1104	0.0078	Rainbow	Age-1	50	11.3104	21.8825	1	0	0	1
3	0	0	12.1104	0.0946	Rainbow	Age-2	50	18.2032	72.8649	1	0	0	1
4	0	0	12.1104	0.4654	Rainbow	Age-3	400	5.78726	2.32669	0.999282	0.6125	0.045	0.3425
5	0	0	12.1104	0.4903	Rainbow	Age-0	50	12.1107	21.6842	0.999485	1	0	0
6	0	0	12.1104	0.4843	Rainbow	Age-1	50	18.2038	72.8653	0.999966	1	0	0
7	0	0	12.1104	0.4607	Rainbow	Age-2	400	5.77933	2.31784	0.999332	0.6075	0	0.3925
8	0	0	12.1104	0.4427	Rainbow	Age-3	50	12.1138	21.6882	0.999933	0.62	0	0.38
9	0	0	12.1104	0.4534	Rainbow	Age-0	397	18.2048	72.8689	0.999933	0.62	0	0.38
10	0	0	12.1104	0.4293	Rainbow	Age-1	50	12.1170	21.6828	0.998346	0.2	0	0.8
11	0	0	12.1104	0.3874	Rainbow	Age-2	50	18.2043	72.8632	0.999542	0.62	0	0.38
12	0	0	12.1104	0.3798	Rainbow	Age-3	397	5.78288	2.31349	0.997582	0.593935	0	0.406065
13	0	0	12.1104	0.3874	Rainbow	Age-0	50	12.1176	21.6968	0.998939	0.62	0	0.38
14	0	0	12.1104	0.3798	Rainbow	Age-1	50	18.2085	72.9195	0.999382	0.78	0	0.22
15	0	0	12.1104	0.4654	Rainbow	Age-2	398	5.78802	2.31563	0.996005	0.611111	0.0228283	0.366006
16	0	0	12.1104	0.4903	Rainbow	Age-3	50	12.1176	21.7026	0.999009	0.62	0	0.38
17	0	0	12.1104	0.4843	Rainbow	Age-0	50	18.2096	72.9277	0.999452	0.64	0	0.36
18	0	0	12.1104	0.4607	Rainbow	Age-1	398	5.79064	2.31022	0.998884	0.633818	0	0.366344
19	0	0	12.1104	0.4427	Rainbow	Age-2	50	12.1179	21.7148	0.999517	0.64	0	0.36
20	0	0	12.1104	0.4534	Rainbow	Age-3	50	18.2093	72.9449	0.999705	0.62	0	0.34
21	0	0	12.1104	0.4293	Rainbow	Age-0	395	5.74464	2.33265	0.995409	0.280795	0	0.713241
22	0	0	12.1104	0.3874	Rainbow	Age-1	50	12.12287	21.717	0.998158	0.22	0	0.78
23	0	0	12.1104	0.3798	Rainbow	Age-2	50	18.2159	72.9509	0.999002	0.46	0	0.54
24	0	0	12.1104	0.3874	Rainbow	Age-3	395	5.74184	2.33322	0.995771	0.6452914	0	0.387089
25	0	0	12.1104	0.4654	Rainbow	Age-0	50	12.1218	21.7242	0.998647	0.64	0	0.36
26	0	0	12.1104	0.4903	Rainbow	Age-1	50	18.2147	72.9634	0.999908	0.82	0	0.18



## Redd summary output

- One row per redd reports egg fates

ReddID	Species	Reach	Cell	DateCreated	DateEmptied	InitialEggs	EggsDiedLow	EggsDiedHighTemp	EggsDiedD	EggsDiedScour	EggsDiedE	EggsEmerg	
1	1319	Rainbow	ClearCkKk	430	4/26/2001	4/30/2001	270	0	0	0	270	0	0
4	1329	Rainbow	ClearCkKk	540	4/3/2001	4/30/2001	265	0	7	0	258	0	0
5	1336	Rainbow	ClearCkKk	525	4/16/2001	4/30/2001	188	0	3	0	185	0	0
6	1331	Rainbow	ClearCkKk	329	4/4/2001	4/30/2001	231	0	7	0	224	0	0
7	1335	Rainbow	ClearCkKk	540	4/13/2001	4/30/2001	294	0	5	0	289	0	0
8	1333	Rainbow	ClearCkKk	104	4/6/2001	4/30/2001	275	0	4	0	271	0	0
9	1334	Rainbow	ClearCkKk	550	4/6/2001	4/30/2001	89	0	0	0	59	30	0
10	1336	Rainbow	ClearCkKk	107	4/5/2001	5/28/2001	301	0	30	0	0	0	271
11	1327	Rainbow	ClearCkKk	540	4/1/2001	5/28/2001	117	0	15	0	0	0	102
12	1338	Rainbow	ClearCkKk	235	4/2/2001	5/30/2001	374	0	30	0	0	0	344
13	1330	Rainbow	ClearCkKk	541	4/3/2001	5/30/2001	189	0	16	0	0	0	173
14	1332	Rainbow	ClearCkKk	322	4/5/2001	5/30/2001	75	0	12	0	0	0	63
15	1337	Rainbow	ClearCkKk	218	4/17/2001	6/7/2001	190	0	33	0	0	0	157
16	1338	Rainbow	ClearCkKk	218	4/18/2001	6/7/2001	76	0	17	0	0	0	59
17	1340	Rainbow	ClearCkKk	525	4/20/2001	6/9/2001	107	0	23	0	0	0	84
18	1339	Rainbow	ClearCkKk	245	4/19/2001	6/9/2001	239	0	47	0	0	0	192
19	1342	Rainbow	ClearCkKk	525	4/22/2001	6/10/2001	255	0	65	0	0	0	190
20	1341	Rainbow	ClearCkKk	104	4/21/2001	6/10/2001	275	0	74	0	0	0	201
21	1344	Rainbow	ClearCkKk	525	5/8/2001	6/19/2001	74	0	26	0	0	0	48
22	1400	Rainbow	ClearCkKk	217	5/25/2001	7/3/2001	255	0	93	0	0	0	162

## Fish (and redds) events output

- Indicates when and where events happened to individual fish (redds)

- Initialized
- Died, of what cause
- Spawning
- etc.

Event	Age	0	1	2	3	
died of fish predation		74	3	0	0	
died of poor condition		277	104	8	13	
died of terr predation		318	77	23	17	
emerged		2046				
initialized		400	50	50		
separated from superindividual		39				
spawned					7	13

PivotTable summary

## You control how much output you get

Every time step:

```

; Model run parameters
set start-date "10/1/2000"
set end-date "9/30/2001"
set file-output-frequency 1 ; Number of time units between file output updates - must be an int
set file-output-units "minutes" ; Time units for file-output-frequency: "minutes", "hours", "days"
; Use 1 "minutes" to get output every time step.
set census-days (list "6/15" "9/30") ; List of days of year (MM/dd format) on which "is-census?"
set census-years-to-skip 2 ; Number of years at start of simulation before "is-census?" can be
    
```

Every 10 days:

```

; Model run parameters
set start-date "10/1/2000"
set end-date "9/30/2001"
set file-output-frequency 10 ; Number of time units between file output updates - must be
set file-output-units "days" ; Time units for file-output-frequency: "minutes", "hours", "da
; Use 1 "minutes" to get output every time step.
set census-days (list "6/15" "9/30") ; List of days of year (MM/dd format) on which "is-ce
set census-years-to-skip 2 ; Number of years at start of simulation before "is-census?"
    
```

## Versions

- Major versions (4, 5, 6...) add significant new capabilities
  - We have no plans for inSTREAM 8
- Minor versions (7.2, 7.3...) have changes that affect results, input files, parameters
- Small updates may designated only via the release date: InSTREAM7.3\_2022-08-09.nlogo
- Changes are documented:
  - User Manual change log
  - Software: Info tab