

Invasive Plant Species

Using Random Numbers for Locating Sample Subplots

Random sampling is the purest form of probability sampling. Each spatial point in the landscape is given an equal probability of being sampled. When there are very large populations, it is often difficult or impossible to identify every member of the population, so the pool of available subjects becomes biased. Random methods are most conducive to statistical analysis.

You will need to use **random numbers** in order to place your sampling plots in the study area. Most calculators have a random number generator (see your calculator manual) or random number generators can be found online. Random number tables can be found online or in reference books, i.e., statistics books, (three are included below). It is recommended that you determine your random numbers BEFORE you go into the field.

1. Determine how you will locate your sampling quadrats in your study site (coordinate system, grid system or line-intercept system) – this will determine the type of numbers required (whole numbers or decimals, 2 or 3 digit numbers, etc.).
2. Decide how many quadrats you want to place in the study site (**M** numbers)– this will determine how many random numbers you will need.
3. Decide on which portion of the random number you will use first XXX digits, last XX digits (number of digits will depend on decision made in (2)).
4. Decide the direction in which to read (up to down, left to right, or right to left). You can “flip a coin” to randomize these decisions.
5. Determine the starting point in table. This can be done by closing your eyes and pointing to a spot on the printed table OR toss a coin onto the page.
6. Select the first **M** numbers read from the table whose first/last X digits meet your needs (see below for examples).
7. Once a number is chosen, do not use it again.
8. If you reach the end of the table before obtaining your M numbers, pick another starting point, read in a different direction, use the first/last X digits, and continue until done.

Locating quadrats using the coordinate system

Example 1: Assume that you have a study site that is 10 m along both axes; this means that your random numbers **MUST** fall between 0 and 10. Remember that numbers along each axis are continuous between 0 and 10 and you will be measuring to the 0.01 m. This means your digits will take the form X.XX, i.e., 1 digit before the decimal point and 2 digits after the decimal point.

You want to sample 8 quadrats per visit. This means you will need 16 random numbers (8-x,y pairs). Your starting point is **column 3, row 2** on Random Number Table. You will be reading down and using the last 3 digits of the random number. In this case, the random numbers are (in **blue** in the table).

There are only 14 numbers in this data string. It is necessary to determine a new starting point and reading directions. Your next starting point is **column 9, row 10** on Random Number Table. You will be reading across (left to right) and using the last 3 digits of the random number. In this case, the random numbers are (in **red** in the table).

59468	99699	14043	15013	12600	33122	94169	89916
08985	50394	96057	28519	05095	37786	92339	96151

The means you will place your quadrats at:

(4.68, 6.99), (0.43, 0.13), (6.00, 1.22), (1.69, 9.16), (9.85, 3.94), (0.57, 5.19), (0.95, 7.86) and (3.39, 1.51).

Random Number Table

Row #	Column Numbers									
	1	2	3	4	5	6	7	8	9	10
1	96268	11860	83699	38631	90045	69696	48572	05917	51905	10052
2	03550	59144	59468	37984	77892	89766	86489	46619	50236	91136
3	22188	81205	99699	84260	19693	36701	43233	62719	53117	71153
4	63759	61429	14043	44095	84746	22018	19014	76781	61086	90216
5	55006	17765	15013	77707	54317	48862	53823	52905	70754	68212
6	81972	45644	12600	01951	72166	52682	37598	11955	73018	23528
7	06344	50136	33122	31794	86723	58037	36065	32190	31367	96007
8	92363	99784	94169	03652	80824	33407	40837	97749	18361	72666
9	96083	16943	89916	55159	62184	86206	09764	20244	88388	98675
10	92993	10747	08985	44999	35785	65036	05933	77378	92339	96151
11	95083	70292	50394	61947	65591	09774	16216	63561	59751	78771
12	77308	60721	96057	86031	83148	34970	30892	53489	44999	18021
13	11913	49624	28519	27311	61586	28576	43092	69971	44220	80410
14	70648	47484	05095	92335	55299	27161	64486	71307	85883	69610
15	92771	99203	37786	81142	44271	36433	31726	74879	89384	76886

Locating quadrats using the grid system

Example 1: Assume that you have a gridded site with 10 quadrats along both axes for a total of 100 cells (10 x 10 = 100) meaning that your random numbers **MUST** fall between 1 and 100. Remember these are whole numbers; this means your digits will take the form XXX, i.e., 3 digits with no numbers after the decimal point.

You want to sample 8 quadrats per visit. Your starting point is **column 3, row 2** on Random Number Table. You will be reading down and using the last 2 digits of the random number. In this case, the random (cell) numbers are (in **blue** in the table):

59468 99699 14043 15013 12600 33122 94169 89916 08985
(eliminate) (additional)

This means that you will sample in grid cells: 68, 99, 43, 13, 22, 69, 16 and 85. The number 12600 has to be eliminated because there is no 0 cell in the grid. An additional number in the list must be chosen to make eight viable grid cells.

Example 2: Make the same assumptions as in Example 1. Now your starting point is **column 2, row 14** on Random Number Table. You will be reading across and using the first 2 digits of the random number. In this case, the random (cell) numbers are (in **red** in the table):

47484 05095 92335 55299 27161 64486 71307 85883

This means that you will sample in grid cells: 47, 5, 92, 55, 27, 64, 71 and 85.

Random Number Table

Row #	Column Numbers									
	1	2	3	4	5	6	7	8	9	10
1	96268	11860	83699	38631	90045	69696	48572	05917	51905	10052
2	03550	59144	59468	37984	77892	89766	86489	46619	50236	91136
3	22188	81205	99699	84260	19693	36701	43233	62719	53117	71153
4	63759	61429	14043	44095	84746	22018	19014	76781	61086	90216
5	55006	17765	15013	77707	54317	48862	53823	52905	70754	68212
6	81972	45644	12600	01951	72166	52682	37598	11955	73018	23528
7	06344	50136	33122	31794	86723	58037	36065	32190	31367	96007
8	92363	99784	94169	03652	80824	33407	40837	97749	18361	72666
9	96083	16943	89916	55159	62184	86206	09764	20244	88388	98675
10	92993	10747	08985	44999	35785	65036	05933	77378	92339	96151
11	95083	70292	50394	61947	65591	09774	16216	63561	59751	78771
12	77308	60721	96057	86031	83148	34970	30892	53489	44999	18021
13	11913	49624	28519	27311	61586	28576	43092	69971	44220	80410
14	70648	47484	05095	92335	55299	27161	64486	71307	85883	69610
15	92771	99203	37786	81142	44271	36433	31726	74879	89384	76886

Locating lines for line-intercept measurements of cover

Example 1: Assume that you have a study site that is 100 m by 50 m. You want to locate 8 lines that are 25 m long within the study area. A line starting at the 25 m mark along the 50 m side is run the full length of the study area (100 m) thereby bisecting the site. Random points are chosen along this “center” line and eight 25 m sampling lines are run out perpendicular to it. The direction of each sampling line can be chosen by flipping a coin.

This means that your random numbers **MUST** fall between 0 and 100 and you need 8 random numbers. Remember that numbers along the central sampling line are continuous between 0 and 100 and you will be measuring to the 0.01 m. This means your digits will take the form XX.XX, i.e., 2 digit before the decimal point and 2 digits after the decimal point.

Your starting point is **column 3, row 2** on Random Number Table. You will be reading down and using the first 4 digits of the random number. In this case, the random numbers are (in **blue** in the table).

59468 99699 14043 15013 12600 33122 94169 89916

The means you will place your sampling lines at:

59.46 m, 99.69 m, 14.04 m, 15.01 m, 12.60 m, 33.12 m, 94.16 m and 89.91 m.

Random Number Table

Row #	Column Numbers									
	1	2	3	4	5	6	7	8	9	10
1	96268	11860	83699	38631	90045	69696	48572	05917	51905	10052
2	03550	59144	59468	37984	77892	89766	86489	46619	50236	91136
3	22188	81205	99699	84260	19693	36701	43233	62719	53117	71153
4	63759	61429	14043	44095	84746	22018	19014	76781	61086	90216
5	55006	17765	15013	77707	54317	48862	53823	52905	70754	68212
6	81972	45644	12600	01951	72166	52682	37598	11955	73018	23528
7	06344	50136	33122	31794	86723	58037	36065	32190	31367	96007
8	92363	99784	94169	03652	80824	33407	40837	97749	18361	72666
9	96083	16943	89916	55159	62184	86206	09764	20244	88388	98675
10	92993	10747	08985	44999	35785	65036	05933	77378	92339	96151
11	95083	70292	50394	61947	65591	09774	16216	63561	59751	78771
12	77308	60721	96057	86031	83148	34970	30892	53489	44999	18021
13	11913	49624	28519	27311	61586	28576	43092	69971	44220	80410
14	70648	47484	05095	92335	55299	27161	64486	71307	85883	69610
15	92771	99203	37786	81142	44271	36433	31726	74879	89384	76886

Random Number Table

Row #	Column Numbers									
	1	2	3	4	5	6	7	8	9	10
1	96268	11860	83699	38631	90045	69696	48572	05917	51905	10052
2	03550	59144	59468	37984	77892	89766	86489	46619	50236	91136
3	22188	81205	99699	84260	19693	36701	43233	62719	53117	71153
4	63759	61429	14043	44095	84746	22018	19014	76781	61086	90216
5	55006	17765	15013	77707	54317	48862	53823	52905	70754	68212
6	81972	45644	12600	01951	72166	52682	37598	11955	73018	23528
7	06344	50136	33122	31794	86723	58037	36065	32190	31367	96007
8	92363	99784	94169	03652	80824	33407	40837	97749	18361	72666
9	96083	16943	89916	55159	62184	86206	09764	20244	88388	98675
10	92993	10747	08985	44999	35785	65036	05933	77378	92339	96151
11	95083	70292	50394	61947	65591	09774	16216	63561	59751	78771
12	77308	60721	96057	86031	83148	34970	30892	53489	44999	18021
13	11913	49624	28519	27311	61586	28576	43092	69971	44220	80410
14	70648	47484	05095	92335	55299	27161	64486	71307	85883	69610
15	92771	99203	37786	81142	44271	36433	31726	74879	89384	76886
16	78816	20975	13043	55921	82774	62745	48338	88348	61211	88074
17	79934	35392	56097	87613	94627	63622	08110	16611	88599	02890
18	64698	83376	87527	36897	17215	74339	69856	43622	22567	11518
19	44212	12995	03581	37618	94851	63020	65348	55857	91742	79508
20	89292	00204	00579	70630	37136	50922	83387	15014	51838	81760
21	08692	87237	87879	01629	72184	33853	95144	67943	19345	03469
22	67927	76855	50702	78555	97442	78809	40575	79714	06201	34576
23	62167	94213	52971	85794	68067	78814	40103	70759	92129	46716
24	45828	45441	74220	84157	23241	49332	23646	09390	13031	51569
25	01164	35307	26526	80335	58090	85871	07205	31749	40571	51755
26	29283	31581	04359	45538	41435	61103	32428	94042	39971	63678
27	19868	49978	81699	84904	50163	22652	07845	71308	00859	87984
28	14292	93587	55960	23159	07370	65065	06580	46285	07884	83928
29	77410	52135	29495	23032	83242	89938	40516	27252	55565	64714
30	36580	06921	35675	81645	60479	71035	99380	59759	42161	93440
31	07780	18093	31258	78156	07871	20369	53977	08534	39433	57216
32	07548	08454	36674	46255	80541	42903	37366	21164	97516	66181
33	22023	60448	69344	44260	90570	01632	21002	24413	04671	05665
34	20827	37210	57797	34660	32510	71558	78228	42304	77197	79168
35	47802	79270	48805	59480	88092	11441	96016	76091	51823	94442
36	76730	86591	18978	25479	77684	88439	34112	26052	57112	91653
37	26439	02903	20935	76297	15290	84688	74002	09467	41111	19194
38	32927	83426	07848	59372	44422	53372	27823	25417	27150	21750
39	51484	05286	77103	47284	00578	88774	15293	50740	07932	87633
40	45142	96804	92834	26886	70002	96643	36008	02239	93563	66429

Random Number Table

Row #	Column Number									
	1	2	3	4	5	6	7	8	9	10
1	87257	58162	24097	35344	71626	30564	72241	92705	43468	85727
2	23930	38657	85479	73153	90003	52325	96113	67925	65441	50915
3	92791	40302	93701	04585	93430	21549	97164	21275	91216	00585
4	75686	79266	04769	21084	35890	06619	03696	67240	91886	74197
5	40199	50062	91876	91565	01998	47852	03455	61002	80048	33381
6	11267	63450	13644	54478	02530	64490	02883	46430	54683	48599
7	35623	41628	63210	66891	40550	90775	22745	24950	72072	89228
8	52029	38996	69052	01409	31408	97587	40417	72628	90887	59824
9	95190	12433	30130	31596	99671	71903	19495	15438	69008	24687
10	74831	05055	91767	42803	60805	97605	75727	32498	88952	94746
11	71040	47243	96527	66414	63056	73455	59433	18585	62441	61265
12	60281	54305	12686	83732	98625	90932	64648	08514	47683	93300
13	88669	29834	26736	17793	26858	85543	56186	99893	16039	18685
14	68998	56624	37193	05329	29925	01241	82687	70456	30668	54400
15	48285	63229	56404	28879	38439	64156	59480	28451	93021	65411
16	61387	10153	59211	11072	96949	56306	20348	58202	52362	84538
17	16115	11805	41374	45102	66458	67047	87425	09086	59172	29872
18	43663	73853	38391	97827	85155	84876	83313	86045	46940	47402
19	58226	43366	17829	72784	28003	02672	85970	29998	41759	00559
20	98108	89500	90446	15027	73873	79219	65322	47684	40929	15673
21	53754	49023	89136	20169	69468	14502	93969	65780	18777	08944
22	30951	69526	41046	77016	24201	14855	17539	95244	22501	07907
23	47862	09955	23599	61139	76971	76741	62988	05712	96249	49756
24	96359	94606	22147	26009	31398	07457	44234	84385	03193	11505
25	48593	18097	15984	35826	24686	61644	67613	59837	72218	83392
26	33854	14137	08726	52815	38834	89693	91897	94085	48209	99757
27	92388	44184	42628	13739	52971	55516	74033	42291	61096	94121
28	22350	02173	26205	85588	01796	09214	81296	86521	73745	59600
29	66258	76414	87652	33169	42890	65613	33365	68175	94288	25747
30	33200	06281	53955	82981	42513	72384	29830	25185	54986	97036
31	39414	58257	84087	74040	00612	42758	42876	59035	47149	88573
32	84362	25796	15027	79001	83443	78103	43149	62272	33734	81190
33	68552	98552	12411	69688	73576	73677	63618	06327	40485	54162
34	93294	75281	32508	62840	24880	59056	81681	60982	88073	62311
35	15638	93026	73177	80626	77155	92184	04143	08049	79627	02882
36	03865	68501	80374	64415	11442	69004	89207	86604	13056	58391
37	80368	21508	74216	53702	30230	05715	37345	08169	63913	84512
38	44512	99825	69751	31220	41539	24309	00754	22808	84007	06853
39	96312	66661	81352	72329	89927	92914	66529	45452	19004	19540
40	88229	09501	98234	47822	46481	22289	70428	36873	36229	97964
41	16103	13417	36836	50919	93579	30210	11490	80318	66671	80749
42	27680	02234	30580	52441	80978	31407	28228	57827	69319	81827
43	56870	28352	28891	25711	39475	71555	87792	34645	49595	51786
44	90870	85656	56503	74990	44909	29780	93207	11213	03336	94993
45	35666	39202	26638	11811	52177	19146	90185	77810	60588	71201
46	92772	77979	64169	19061	96708	81629	03937	85957	08459	59300
47	34894	50742	20356	70952	32751	05468	97786	99222	48140	93592
48	51343	14368	21136	83905	24470	27863	86417	66868	91850	13629
49	59161	68137	11603	36229	93579	49108	22834	18534	33358	33999
50	93157	66185	70112	74556	98520	11380	88700	40738	19218	40839

Random Number Table

Row number	Column number											
	1	2	3	4	5	6	7	8	9	10	11	12
1	20	288	215	98	44	202	323	226	162	262	248	276
2	331	171	204	131	185	39	183	338	209	352	285	333
3	250	142	85	145	348	55	327	137	289	135	146	282
4	259	226	225	215	219	306	267	181	29	328	247	280
5	143	103	64	332	199	215	159	145	84	87	135	250
6	234	261	211	152	181	198	59	179	99	29	106	342
7	360	61	177	310	265	150	23	8	83	122	303	112
8	86	103	313	117	254	284	17	347	296	196	153	251
9	120	191	52	93	297	209	290	251	155	210	47	357
10	6	105	155	77	191	147	356	245	262	36	268	32
11	37	2	259	115	3	24	105	115	130	246	256	61
12	357	180	52	190	311	20	48	348	12	322	223	355
13	326	227	40	93	217	100	336	262	272	83	179	48
14	336	322	174	335	94	358	303	337	253	253	42	163
15	240	213	217	8	184	72	219	136	211	64	154	217
16	289	327	291	216	112	106	147	181	33	311	7	111
17	140	32	297	319	342	15	30	53	54	55	10	139
18	125	81	128	59	121	236	307	264	328	120	247	127
19	351	21	132	172	148	91	93	334	74	126	223	62
20	80	91	98	280	41	146	219	271	248	246	185	179
21	198	255	26	201	330	134	100	19	41	50	192	349
22	80	225	321	260	161	330	260	333	195	145	42	169
23	66	54	140	179	179	46	311	87	340	341	287	98
24	19	185	137	346	163	224	13	72	208	48	124	288
25	281	321	20	16	5	48	70	91	122	305	240	75
26	126	61	317	336	188	184	23	31	174	280	115	88
27	355	267	117	253	186	72	1	221	345	86	89	355
28	321	327	358	78	320	261	187	325	100	91	179	184
29	201	341	29	14	341	63	253	249	226	170	311	127
30	308	233	229	344	215	341	318	334	144	326	70	148
31	195	42	88	337	122	97	84	215	298	168	300	312
32	22	115	136	100	110	73	219	290	133	70	23	55
33	48	190	121	352	200	249	135	55	336	17	263	269
34	175	225	341	307	283	280	359	348	143	230	102	283
35	133	17	293	356	45	151	49	69	334	340	151	251
36	188	43	324	343	104	302	168	92	97	43	321	268
37	133	103	334	241	207	12	208	168	16	153	121	268
38	351	360	102	5	85	226	246	16	155	323	113	260
39	80	354	191	267	197	169	172	348	271	231	40	164
40	299	311	165	41	211	64	281	91	95	186	283	299

Select a row from 1 to 40 and a column from 1 to 12. Use the number at the intersection of the selected row and column.